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Glaucidium radiatum malabaricum
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IBAs and the Way Ahead

Important Bird and Biodiversity Areas (IBAs) are sites of international significance for the conservation of birds and their habitats at the global, regional, and sub-regional level. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected area network. The selection of IBAs is a particularly effective way of identifying conservation priorities. A site is recognized as an IBA only if it meets certain criteria based on the occurrence of key bird species that are vulnerable to global extinction or whose populations are otherwise irreplaceable. The IBA criteria, which are applicable globally, are as follows (sub-criteria are not being given here):

A1: Sites holding threatened bird species of global conservation concern.

A2: Sites having restricted range bird species, i.e. bird species with a historic breeding range up to 50,000 sq. km in the world.

A3: Sites having biome restricted bird species, i.e. key bird species representing distinct habitat types.

A4: Sites having large congregations of birds.

IBA programme in India

The Bombay Natural History Society (BNHS) is the BirdLife Partner in India, and is responsible for coordinating the IBA programme in the country. The programme was launched in 1999 by the BNHS, BirdLife International, and Royal Society for Protection of Birds (RSPB).

In 2004, BNHS identified 466 IBAs in India through a network of over 100 organizations and 1,000 individuals. Of these 466 IBAs, 191 were Wildlife Sanctuaries, 52 were National Parks, 23 were Tiger Reserves, and one was a Conservation Reserve. A total of 199 IBAs (almost 43%) were located outside the Protected Area Network (PAN), with no official protection! A revised IBA directory was published in 2016, with descriptions of 554 IBA sites, which is an increase of 88 new additions to the inventory. Analysis of the data from these 554 IBAs shows that 506 sites have globally threatened species (A1), 240 sites hold restricted range species (A2), 99 sites qualify on the basis of biome-restricted assemblages (A3), and 136 sites fit the congregatory criteria (A4). Out of 554 IBAs, 312 IBAs are officially protected and 242 IBAs are unprotected.

Threats to IBAs

Altogether, we have identified 26 major threats to IBAs and to threatened species. The foremost threat to IBAs in India is from human settlements and encroachment, because in a country with more than a billion people, pressure on land is immense. Intensive agricultural practice is also a serious threat to IBAs, especially in the northern Indian states such as Punjab, Haryana, and Uttar Pradesh. Agricultural intensification, which seriously affects 321 IBAs, involves excessive use of chemicals, changes in crop species or cultivation, loss of habitat, and effects of pesticides on non-target species.

Overgrazing is another major problem all over the country, but especially in the grassland IBAs. Overgrazing causes adverse impacts on the habitats of grassland inhabiting birds such as Lesser Florican *Sypheotides indica*, Great Indian Bustard *Ardeotis nigriceps*, Bengal Florican *Houbaropsis bengalensis*, larks, pipits, and many others. The grazing policy in India is not effective, and even in many protected areas, illegal grazing is seen.

Deforestation has been the key issue in the Andaman & Nicobar Islands, while in the northeastern states of the Eastern Himalaya, rapid reduction in the cycle of shifting cultivation (*jhum*) has resulted in the loss of habitats. For example in Meghalaya, shifting cultivation has resulted in the loss of large areas of forest and severe soil erosion.

Many of the IBAs will be badly affected by hydroelectric projects, especially in the northeastern states. A large number of IBAs in the Northeast are impacted or likely to be impacted by large dams due to a range of issues: submergence, downstream impacts, pressures on forests due to migrant labour, etc. Besides dams, in the Western Himalaya, habitat is being lost at important sites because of development projects such as expansion of road network. These projects adversely affect the habitats of some globally threatened species of this region, such as the Western Tragopan *Tragopan melanocephalus*, Cheer Pheasant *Catreus wallichi*, Himalayan Quail *Ophrysia superciliosa* (now practically extinct), and Kashmir Flycatcher *Ficedula subrubra*.

Rapid industrialization along the coast has put several key IBA sites at high risk. Unregulated tourism, sand mining, coastal power plants, sea walls, and so on are significantly altering the shore features, seriously affecting migratory waders. Other threats to IBAs include habitat loss and hunting for food and sport.

Conservation of IBAs, especially those outside the PA network, is a huge challenge. There is no one solution for these complex conservation challenges. While strengthening the PA network is the need of the hour, we need to work on newer approaches to conservation, considering the local resistance to new PAs. Engaging local people assumes great significance in this scenario. The concept of Smart PAs needs to be explored, along with other non-invasive instruments where local people, who are the main stakeholders, can play a significant role in conservation.

Expanding infrastructure continues to exert additional pressure to existing issues. Even “green” infrastructure like solar and wind energy, if done in the wrong place may become a “Red Industry”. To state a specific case, transmission lines for both conventional and renewable power sector are proving to be catastrophic in the last remaining Great Indian Bustard areas. In the last one year, we have lost three adult birds by collision with transmission lines. The number may sound very small, but considering that the global population of GIB is less than 200, the loss of three adult birds is highly significant.

The integration of IBAs in the MoEFCC’s Decision Support System (DSS) is thus a vital tool and can provide various stakeholders rapid inputs on the IBAs, but it also needs to be brought in the public domain. BNHS will soon be launching IBA DSS, where the revised IBA directory will be linked for easy and free of cost access to anyone who is keen to use this resource.

JBNHS STEPS TOWARDS ADVANCED ONLINE PUBLICATION

With changing times and advanced technology, *JBNHS* has been evolving with respect to its functionality. Adhering to its aim of disseminating science, another step towards progress and updated approach is implementation of Advanced Online Publication (AOP).

AOP is a system by which papers get published online (ahead of print) on the journal’s AOP website. The uploaded paper will bear a DOI (digital object identifier) code and the paper can be referenced/cited using this code DOI. A DOI is a unique alphanumeric string assigned by the International DOI Foundation to identify content and provide a persistent link to its location on the Internet. The main benefit of publishing articles ahead of print is that the time between submission and publication is significantly reduced, which is essential in this digital age, where the web is increasingly used as the primary source of information.

The only difference between this online publication and the printed product is that the article will not have page numbers. After printing, the paper will be removed from the AOP table of contents and transferred to that issue’s table of contents on the website, and here, the paper will be assigned page numbers. The DOI will remain associated with a manuscript, and papers can be traced online by their DOI. DOIs are used by more and more publishers of scientific literature, and with the increasing shift of emphasis from print to online publication, this system looks set to become a universal practice for publishing and identifying research papers.

AOP has come as the silver lining to the dark clouds that have been threatening the existence of *JBNHS*, and our opting for this new scheme will help to steer the Society’s more than a century old journal through its journey into the future.

Deepak Apte

BIRDS OF SUHELDEV WILDLIFE SANCTUARY, BALRAMPUR AND SHRAVASTI DISTRICTS, UTTAR PRADESH, INDIA

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The paper deals with the avifauna of Suheldev, also called Suhelwa, Wildlife Sanctuary, Uttar Pradesh, based on a study carried out from November 2013 to November 2014. The primary focus of the study was to make an inventory of the birds of the Sanctuary with special reference to ascertaining the status of threatened species of the area. A total of 298 bird species were recorded during the study, including 3 Critically Endangered, 3 Endangered, 7 Vulnerable, and 16 Near Threatened species.

INTRODUCTION

Suheldev Wildlife Sanctuary is a part of the Terai Arc Landscape and has been designated as an Important Bird Area (UP-23), based on the presence of threatened and biome-restricted species (Islam and Rahmani 2004; Rahmani *et al.* 2011). The Sanctuary was considered as a Data Deficient site for birds (Islam and Rahmani 2004), with only a basic listing of species given in the Sanctuary's Management Plan (2011–12 to 2020–21). To fill this lacuna, we undertook an intensive one year study, covering all areas and habitats of the sanctuary, to document the avifauna, with special reference to threatened species.

STUDY AREA

Suheldev Wildlife Sanctuary (27° 30' 1"–27° 55' 42" N; 81° 55' 36"–82° 48' 33" E), flanked by Nepal on three sides, lies immediately south of Churia hills in Nepal. It is situated in the Tulsipur *tehsil* of Balrampur district and Bhinga *tehsil* of Shravasti district in Uttar Pradesh, India. The area primarily comprises rugged mountains and boulder-strewn riverbeds, especially along the northern boundary. It is contiguous with the forests of Dang in Nepal, and is connected to Banke National Park, which is part of the Bardia forest complex of Nepal. The area is drained by 8–10 major seasonal rivers, many of which flow into artificial reservoirs built along the southern boundary of the Sanctuary (Chanchani *et al.* 2014).

The Sanctuary, approximately 120 km long and 6–8 km wide, is situated at elevations of 120–202 m above msl, and has a core area of 45,200 ha and a buffer zone of 23,000 ha. It is divided into seven ranges: five ranges constituting the core area and two ranges occurring in the buffer area. The West Sohewa and East Sohewa ranges are in Shravasti district,

while the rest are in Balrampur district. All the ranges are further divided into beats and compartments.

The area receives around 1,300 mm rainfall. There are 11 tanks and reservoirs in and around the Sanctuary, namely Motipur, Rampur, Vanghohwa, Khairman, Girgitahi, Ganeshpur, Baghelkhand, Bhagwanpur, Majgaowan, Chittaurgarh, and Kohargaddi. Most of the reservoirs tend to dry up by the end of February, except for the Chittaurgarh and Kohargaddi reservoirs, which are large and present near the forest areas. These two reservoirs are the main water sources for wildlife in the Sanctuary. However, the Irrigation Department tries to maintain about 50–60 cm water level in at least one-third area of most of the reservoirs for use during the dry season. The reservoirs with their seepage areas and other water bodies, ranging from 3 ha to 900 ha, support a variety of waterbirds especially during winter.

The Sanctuary falls under the Terai-Bhabhar biogeographic subdivision of the Upper Gangetic Plain (7A), according to the biogeographic classification of Rodgers and Panwar (1988). It is characterized by elements of the Bhabhar zone, typified by porous rocky riverbeds and undulating terrain along the Himalayan foothills. Terai habitats such as tall wet grass stands are absent in Suheldev. The tropical moist deciduous forest is dominated by *Sal Shorea robusta* interspersed with *Syzygium cumini*, *Terminalia tomentosa*, *Acacia catechu*, and grass species of *Vetiveria*, *Themeda*, *Imperata*, *Saccharum*, and *Arundo*. Teak *Tectona grandis* was raised by the Forest Department in the past, but planting stopped after the declaration of the Sanctuary. The unique geophysical attributes of the area, its plantation history, and the numerous drainages and reservoirs have given rise to a mosaic of varied forest types such as sal, teak, broadleaf moist deciduous, and semi-evergreen, with small patches of grassland fringing the reservoirs.

Nearly 40 species of mammals, including the tiger *Panthera tigris*, are found in the Sanctuary, although there has been a significant decline in the tiger population (Johnsingh *et al.* 2004). Large prey species such as chital *Axis axis*, wild boar *Sus scrofa*, nilgai *Boselaphus tragocamelus*, sambar *Rusa unicolor*, barking deer *Muntiacus muntjak*, and hog deer *Axis porcinus* appear to be rare in Suheldev. Leopard *Panthera pardus* and striped hyena *Hyaena hyaena* appear to be widely distributed. Studies by Jhala *et al.* (2008), Johnsingh *et al.* (2004) and Chanchani *et al.* (2014) indicate signs of the presence of sloth bear *Melursus ursinus*.

METHODS

From November 2013 to November 2014, we surveyed all the ranges and wetlands of the Sanctuary, covering the diversity of habitats to obtain checklists of birds inhabiting the different habitats. Besides the sightings obtained during the surveys, six transects of one kilometre length each were laid in the various habitat types, where systematic sampling was carried out during the mornings.

RESULTS AND DISCUSSION

A total of 298 bird species were recorded during the study (Table 1). The Management Plan (2011–2012 to 2020–2021) of the Sanctuary lists 223 bird species, of which 212 species were recorded during our study. We recorded an additional 86 species that are not listed in the Forest Department's checklist. Along with these, the bird checklist for Suheldev Wildlife Sanctuary adds up to 310 species.

Twelve species not recorded by us, but listed in the Forest Department's checklist, were Spot-billed Pelican *Pelecanus philippensis*, Great White Pelican *P. onocrotalus*, Striated Heron *Butorides striata*, White Stork *Ciconia ciconia*, Greater Adjutant *Leptoptilos dubius*, Laggar Falcon *Falco jugger*, Swamp Francolin *Francolinus gularis*, Red Spurfowl *Galloperdix spadicea*, Lesser Florican *Sypheotides indicus*, Brown Crake *Porzana akool*, Indian Skimmer *Rynchops albicollis*, and Grey Treepie *Dendrocitta formosae*. Despite our efforts to look out for them, especially since some of them are in the threatened category of IUCN, besides many of them being large and conspicuous species, we did not sight them.

Of the 298 species recorded during the study, 181 (61%) species are year-round residents that are likely to breed in the sanctuary area or adjoins, judging by their presence throughout the year – no breeding bird surveys were carried out during the study. Winter migrants constitute at least 80 (27%) species, the majority comprise waterfowl, besides other migratory species such as flycatchers, warblers, and

wagtails. Six species are breeding visitors (summer migrants), and 17 (6%) species show local movements. There are five passage migrants which stay in the area for a day or two, or occasionally for a week or so. The Amur Falcon *Falco amurensis* is a fall migrant, i.e., it passes through only during the onset of migration in November (Bhargava *et al.* 2014) and was seen for the first time in Uttar Pradesh. The Yellow-breasted Bunting *Emberiza aureola* is a spring migrant, passing through this area in March on its return migration. The Demoiselle Crane *Grus virgo*, Red-headed Bunting *Emberiza melanocephala*, and Black-headed Bunting *Emberiza bruniceps* are two-way migrants, i.e. passing through the area at the start and the end of winter.

Of the 298 species recorded in the Sanctuary during our study, 29 (nearly 10%) species are listed under the globally threatened categories of IUCN. These include 3 Critically Endangered, 3 Endangered, 7 Vulnerable, and 16 Near Threatened species. Their sightings are discussed below:

CRITICALLY ENDANGERED

Slender-billed Vulture *Gyps tenuirostris*

We recorded the Slender-billed Vulture on seven occasions in four ranges: East Sohelwa, West Sohelwa, Rampur, and Tulsipur. Not less than 20 Slender-billed were sighted during the winter of 2013–14. The Sohelwa population, though small, is significant considering its Critically Endangered status. It probably breeds in the Poorvi Sohelwa Range, thus making Suheldev a very important site for this species.

White-rumped Vulture *Gyps bengalensis*

We recorded the White-rumped Vulture from four ranges: East Sohelwa, West Sohelwa, Rampur, and Tulsipur. More than 60 birds were sighted among mixed flocks of Slender-billed and Himalayan Griffon *Gyps himalayensis* from the buffer areas of the Sanctuary. The presence of more than 60% juveniles indicates good breeding success of this species in the Suheldev area. The presence of livestock around the Sanctuary ensures a good food supply for these birds, nevertheless, there is a corresponding threat if the drug diclofenac is used for treatment of sick cattle.

In Uttar Pradesh, the White-rumped now occurs in small numbers in certain pockets. According to Rahmani *et al.* (2014), there are numerous records of White-rumped Vulture from the Suheldev area in recent years: a mixed flock of 50+ birds (along with Himalayan and Eurasian Griffon *Gyps fulvus*) along the Balrampur-Tulsipur road in March 2009; over 30 vultures roosting on a mango tree and a dry silk cotton tree in a grassland near Motipur reservoir in December 2009; regular sighting of 20 to 60 vultures from East and West

BIRDS OF SUHELDEV WILDLIFE SANCTUARY, UTTAR PRADESH

Table 1: Birds recorded in Suheldev Wildlife Sanctuary during the study

S. No.	Species	Status	Habitat	Occurrence	Threat Category
1.	Little Grebe <i>Tachybaptus ruficollis</i>	RB	WL	C	LC
2.	Black-necked Grebe <i>Podiceps nigricollis</i>	WV	WL	O	LC
3.	Great Crested Grebe <i>Podiceps cristatus</i>	WV	WL	O	LC
4.	Indian Shag <i>Phalacrocorax fuscicollis</i>	LM	WL	U	LC
5.	Great Cormorant <i>Phalacrocorax carbo</i>	RB/LM	WL	C	LC
6.	Little Cormorant <i>Microcarbo niger</i>	RB	WL	C	LC
7.	Oriental Darter <i>Anhinga melanogaster</i>	RB	WL	O	NT
8.	Little Egret <i>Egretta garzetta</i>	RB	WL	C	LC
9.	Great Egret <i>Egretta alba</i>	RB	WL	C	LC
10.	Intermediate Egret <i>Egretta intermedia</i>	RB	WL	C	LC
11.	Eastern Cattle Egret <i>Bubulcus coromandus</i>	RB	WL/ML/RF/AGR	C	LC
12.	Grey Heron <i>Ardea cinerea</i>	RB/LM	WL/ML	O	LC
13.	Purple Heron <i>Ardea purpurea</i>	RB	WL/ML	O	LC
14.	Indian Pond-heron <i>Ardeola grayii</i>	RB	ML/ RF	C	LC
15.	Black-crowned Night-heron <i>Nycticorax nycticorax</i>	RB	WL/ML	O	LC
16.	Black Bittern <i>Dupetor flavicollis</i>	BV	WL/ML	U	LC
17.	Chestnut Bittern <i>Ixobrychus cinnamomeus</i>	UC	ML	O	LC
18.	Asian Openbill <i>Anastomus oscitans</i>	RB	ML/WL/AGR	C	LC
19.	White Stork <i>Ciconia ciconia</i>	WV	ML/WL	U	LC
20.	Asian Woollyneck <i>Ciconia episcopus</i>	WV	ML/WL	O	VU
21.	Painted Stork <i>Mycteria leucocephala</i>	WV	ML/ RF	O	NT
22.	Black Stork <i>Ciconia nigra</i>	WV	WL	C	LC
23.	Black-necked Stork <i>Ephipporhynchus asiaticus</i>	RB	WL	U	NT
24.	Lesser Adjutant <i>Leptoptilos javanicus</i>	WV	WL/ML/AGR	U	VU
25.	Glossy Ibis <i>Plegadis falcinellus</i>	WV	WL/ML	O	LC
26.	Black-headed Ibis <i>Threskiornis melanocephalus</i>	RB	WL/ML	O	NT
27.	Eurasian Spoonbill <i>Platalea leucorodia</i>	LM	WL/ML	U	LC
28.	Indian Black Ibis <i>Pseudibis papillosa</i>	RB	WL/ML	C	LC
29.	Bar-headed Goose <i>Anser indicus</i>	WV	WL/AGR	C	LC
30.	Greylag Goose <i>Anser anser</i>	WV	WL/AGR	C	LC
31.	Lesser Whistling-duck <i>Dendrocygna javanica</i>	RB/LM	WL/ML/AGR	C	LC
32.	Common Shelduck <i>Tadorna tadorna</i>	WV	WL	C	LC
33.	Ruddy Shelduck <i>Tadorna ferruginea</i>	WV	WL/AGR	U	LC
34.	Knob-billed Duck <i>Sarkidiornis melanotos</i>	RB/LM	WL/ML	C	LC
35.	Common Teal <i>Anas crecca</i>	WV	WL/ML	C	LC
36.	Garganey <i>Querquedula querquedula</i>	WV	WL	C	LC
37.	Falcated Duck <i>Mareca falcata</i>	WV	WL	O	NT
38.	Gadwall <i>Mareca strepera</i>	WV	WL	C	LC
39.	Eurasian Wigeon <i>Mareca penelope</i>	WV	WL	C	LC
40.	Northern Shoveler <i>Spatula clypeata</i>	WV	WL	C	LC
41.	Northern Pintail <i>Anas acuta</i>	WV	WL	C	LC
42.	Indian Spot-billed Duck <i>Anas poecilorhyncha</i>	RB	WL	C	LC
43.	Mallard <i>Anas platyrhynchos</i>	WV	WL	O	LC
44.	Tufted Duck <i>Aythya fuligula</i>	WV	WL	C	LC
45.	Ferruginous Duck <i>Aythya nyroca</i>	WV	WL	U	NT

Table 1: Birds recorded in Suheldev Wildlife Sanctuary during the study (*contd.*)

S. No.	Species	Status	Habitat	Occurrence	Threat Category
46.	Common Pochard <i>Aythya ferina</i>	WV	WL	C	VU
47.	Red-crested Pochard <i>Netta rufina</i>	WV	WL	C	LC
48.	Cotton Teal <i>Nettapus coromandelianus</i>	RB/LM	WL/ML	C	LC
49.	Black-winged Kite <i>Elanus caeruleus</i>	RB	WGL/AGR	C	LC
50.	Black Kite <i>Milvus migrans</i>	RB	WGL/AGR	C	LC
51.	Shikra <i>Accipiter badius</i>	RB	MF/WGL	C	LC
52.	Eurasian Sparrowhawk <i>Accipiter nisus</i>	WV	MF/WGL	U	LC
53.	Long-legged Buzzard <i>Buteo rufinus</i>	WV	MF/WGL	U	LC
54.	Oriental Honey-buzzard <i>Pernis ptilorhynchus</i>	RB	MF/MC	O	LC
55.	White-eyed Buzzard <i>Butastur teesa</i>	RB	AGR/WGL	C	LC
56.	Crested Serpent-eagle <i>Spilornis cheela</i>	RB	MF/RF/MC	C	LC
57.	Short-toed Eagle <i>Circaetus gallicus</i>	RB	WGL/MF	U	LC
58.	Booted Eagle <i>Hieraaetus pennatus</i>	WV	WGL/MF	U	LC
59.	Changeable Hawk-eagle <i>Nisaetus limnaeetus</i>	RB	MF/WGL	U	LC
60.	Indian Spotted Eagle <i>Clanga hastata</i>	RB	MF/AGF	U	VU
61.	Greater Spotted Eagle <i>Clanga clanga</i>	WV	MF/AGF	U	VU
62.	Steppe Eagle <i>Aquila nipalensis</i>	WV	MF/WGL	U	LC
63.	Tawny Eagle <i>Aquila rapax</i>	RB	MF/WGL	U	LC
64.	Western Osprey <i>Pandion haliaetus</i>	WV	WL	O	LC
65.	Lesser Fish-eagle <i>Ichthyophaga humilis</i>	RB	RF	U	NT
66.	Grey-headed Fish-eagle <i>Ichthyophaga ichthyaetus</i>	RB	RF	U	NT
67.	White-rumped Vulture <i>Gyps bengalensis</i>	RB	AGR/WGL	C	CR
68.	Slender-billed Vulture <i>Gyps tenuirostris</i>	RB	AGR/WGL	O	CR
69.	Griffon Vulture <i>Gyps fulvus</i>	WV	AGR/WGL	C	LC
70.	Himalayan Vulture <i>Gyps himalayensis</i>	LM	AGR/WGL	C	NT
71.	Egyptian Vulture <i>Neophron percnopterus</i>	RB	AGR/WGL	O	EN
72.	Red-headed Vulture <i>Aegypius calvus</i>	RB	AGR/WGL	O	CR
73.	Cinereous Vulture <i>Aegypius monachus</i>	WV	AGR/WGL	O	NT
74.	Pallid Harrier <i>Circus macrourus</i>	WV	AGR/WGL	U	NT
75.	Pied Harrier <i>Circus melanoleucos</i>	WV	AGR/WGL	U	LC
76.	Western Marsh-harrier <i>Circus aeruginosus</i>	WV	ML/WL	O	LC
77.	Common Kestrel <i>Falco tinnunculus</i>	WV	AGR/WGL	C	LC
78.	Amur Falcon <i>Falco amurensis</i>	FM	AGR	U	LC
79.	Red-headed Falcon <i>Falco chicquera</i>	RB	WGL/AGR/	O	NT
80.	Peregrine Falcon <i>Falco peregrinus</i>	WV	WL/WGL	U	LC
81.	Grey Francolin <i>Francolinus pondicerianus</i>	RB	AGR/WGL	C	LC
82.	Black Francolin <i>Francolinus francolinus</i>	RB	AGR/WGL	C	LC
83.	Common Quail <i>Coturnix coturnix</i>	WV/RB?	AGR/WGL	O	LC
84.	Rain Quail <i>Coturnix coromandelica</i>	WV/RB?	AGR/WGL	O	LC
85.	Blue-breasted Quail <i>Excalfactoria chinensis</i>	RB	AGR/WGL	U	LC
86.	Barred Buttonquail <i>Turnix suscitator</i>	RB	AGR/WGL	C	LC
87.	Red Junglefowl <i>Gallus gallus</i>	RB	MF/MC	C	LC
88.	Indian Peafowl <i>Pavo cristatus</i>	RB	MF/MC/AGR	C	LC
89.	Sarus Crane <i>Grus antigone</i>	RB	ML/AGR	U	VU
90.	Demoiselle Crane <i>Grus virgo</i>	TWV	ML/WL	U	LC

Table 1: Birds recorded in Suheldev Wildlife Sanctuary during the study (*contd.*)

S. No.	Species	Status	Habitat	Occurrence	Threat Category
91.	Ruddy-breasted Crake <i>Porzana fusca</i>	RB	ML/WL	U	LC
92.	White-breasted Waterhen <i>Amaurornis phoenicurus</i>	RB	ML/ACF	C	LC
93.	Watercock <i>Gallicrex cinerea</i>	RB	ML/WL	O	LC
94.	Purple Swampphen <i>Porphyrio [porphyrio] poliocephalus</i>	RB	ML/WL	C	LC
95.	Common Moorhen <i>Gallinula chloropus</i>	RB	ML/WL	C	LC
96.	Eurasian Coot <i>Fulica atra</i>	WV	WL	C	LC
97.	Black-winged Stilt <i>Himantopus himantopus</i>	WV	ML	C	LC
98.	Pheasant-tailed Jacana <i>Hydrophasianus chirurgus</i>	RB	ML/WL	C	LC
99.	Bronze-winged Jacana <i>Metopidius indicus</i>	RB	ML/WL	C	LC
100.	Great Thick-knee <i>Esacus recurvirostris</i>	RB	WL	U	LC
101.	Indian Stone-curlew <i>Burhinus indicus</i>	RB	AGR/WGL	O	LC
102.	Small Pratincole <i>Glareola lactea</i>	RB	ML	U	LC
103.	Indian Courser <i>Cursorius coromandelicus</i>	RB	AGR	U	LC
104.	Red-wattled Lapwing <i>Vanellus indicus</i>	RB	AGR	C	LC
105.	Yellow-wattled Lapwing <i>Vanellus malabaricus</i>	WV	AGR	U	LC
106.	Grey-headed Lapwing <i>Vanellus cinereus</i>	WV	ML	U	LC
107.	White-tailed Lapwing <i>Vanellus leucurus</i>	WV	ML	U	LC
108.	River Lapwing <i>Vanellus duvaucelii</i>	RB	WL/ML	O	NT
109.	Northern Lapwing <i>Vanellus vanellus</i>	WV	ML	U	LC
110.	Little Ringed Plover <i>Charadrius dubius</i>	WV	ML	C	LC
111.	Common Greenshank <i>Tringa nebularia</i>	WV	ML	O	LC
112.	Wood Sandpiper <i>Tringa glareola</i>	WV	ML	O	LC
113.	Green Sandpiper <i>Tringa ochropus</i>	WV	ML	O	LC
114.	Common Sandpiper <i>Actitis hypoleucos</i>	WV	ML	O	LC
115.	Marsh Sandpiper <i>Tringa stagnatilis</i>	WV	ML	C	LC
116.	Common Redshank <i>Tringa totanus</i>	WV	ML	O	LC
117.	Spotted Redshank <i>Tringa erythropus</i>	WV	ML	O	LC
118.	Ruff <i>Philomachus pugnax</i>	WV	ML	C	LC
119.	Temminck's Stint <i>Ereunetes temminckii</i>	WV	ML	O	LC
120.	Little Stint <i>Ereunetes minutus</i>	WV	ML	C	LC
121.	Great Painted-snipe <i>Rostratula benghalensis</i>	RB	ML	O	LC
122.	Common Snipe <i>Gallinago gallinago</i>	WV	ML	U	LC
123.	Brown-headed Gull <i>Chroicocephalus brunnicephalus</i>	WV	WL	C	LC
124.	Common Black-headed Gull <i>Chroicocephalus ridibundus</i>	WV	WL	C	LC
125.	Black-bellied Tern <i>Sterna acuticauda</i>	RB	WL	U	EN
126.	River Tern <i>Sterna aurantia</i>	RB	WL	O	NT
127.	Whiskered Tern <i>Chlidonias hybrida</i>	RB	WL	O	LC
128.	Blue Rock Pigeon <i>Columba livia</i>	RB	AGR	C	LC
129.	Oriental Turtle-dove <i>Streptopelia orientalis</i>	RB	MF	C	LC
130.	Laughing Dove <i>Spilopelia senegalensis</i>	RB	AGR	C	LC
131.	Red Collared-dove <i>Streptopelia tranquebarica</i>	RB	AGR	C	LC
132.	Spotted Dove <i>Spilopelia chinensis</i>	RB	MF/MC/AGR	C	LC
133.	Eurasian Collared-dove <i>Streptopelia decaocto</i>	RB	AGR/MF/WGL	C	LC
134.	Emerald Dove <i>Chalcophaps indica</i>	RB	MF/MC	C	LC
135.	Orange-breasted Green-pigeon <i>Treron bicinctus</i>	RB	MF	O	LC

Table 1: Birds recorded in Suheldev Wildlife Sanctuary during the study (*contd.*)

S. No.	Species	Status	Habitat	Occurrence	Threat Category
136.	Yellow-footed Green-pigeon <i>Treron phoenicopterus phoenicopterus</i>	RB	MF	C	LC
137.	Ashy-headed Green-pigeon <i>Treron phayrei</i>	RB	MF	U	NT
138.	Plum-headed Parakeet <i>Psittacula cyanocephala</i>	RB	MF/MC	C	LC
139.	Rose-ringed Parakeet <i>Psittacula krameri</i>	RB	MF/MC/AGR	C	LC
140.	Alexandrine Parakeet <i>Psittacula eupatria</i>	RB	MF/MC	C	NT
141.	Slaty-headed Parakeet <i>Psittacula himalayana</i>	LM	MF	U	LC
142.	Green-billed Malkoha <i>Phaenicophaeus tristis</i>	RB	MF/MC	U	LC
143.	Sirkeer Malkoha <i>Taccocua leschenaultii</i>	RB	MF/MC/AGR	U	LC
144.	Lesser Coucal <i>Centropus bengalensis</i>	RB	GL	O	LC
145.	Greater Coucal <i>Centropus sinensis</i>	RB	WGL/AGR	C	LC
146.	Brown Hawk-owl <i>Ninox scutulata</i>	RB	MF/WGL/MC	U	LC
147.	Common Barn-owl <i>Tyto alba</i>	RB	WGL/MF	U	LC
148.	Indian Scops-owl <i>Otus bakkamoena</i>	RB	MF/MC	U	LC
149.	Spotted Owlet <i>Athene brama</i>	RB	AGF/MF	C	LC
150.	Jungle Owlet <i>Glaucidium radiatum</i>	RB	MF/WGL/MC	C	LC
151.	Indian Eagle-owl <i>Bubo bengalensis</i>	RB	MF/MC	U	LC
152.	Forest Eagle-owl <i>Ketupa nipalensis</i>	RB	MF/MC	U	LC
153.	Brown Fish-owl <i>Ketupa zeylonensis</i>	RB	MF/MC	U	LC
154.	Indian Little Nightjar <i>Caprimulgus asiaticus</i>	RB	MC/MF	O	LC
155.	Crested Tree-swift <i>Hemiprocne coronata</i>	RB	WL/WGL/AGR	U	LC
156.	Asian Palm-swift <i>Cypsiurus balasiensis</i>	RB	MF/WGL	C	LC
157.	Little Swift <i>Apus affinis</i>	RB	MF/WGL	C	LC
158.	Indian Roller <i>Coracias benghalensis benghalensis</i>	RB	MF/GL	C	LC
159.	Common Hoopoe <i>Upupa epops</i>	RB	AGR/WGL/MF	C	LC
160.	Stork-billed Kingfisher <i>Pelargopsis capensis</i>	RB	RF/WL	C	LC
161.	Black-capped Kingfisher <i>Halcyon pileata</i>	WV	RF	U	LC
162.	White-throated Kingfisher <i>Halcyon smyrnensis</i>	RB	RF/WL/WGL	C	LC
163.	Himalayan Pied Kingfisher <i>Ceryle lugubris</i>	LM	WL	U	LC
164.	Lesser Pied Kingfisher <i>Ceryle rudis</i>	RB	WL	C	LC
165.	Common Kingfisher <i>Alcedo atthis</i>	RB	WL	O	LC
166.	Little Green Bee-eater <i>Merops orientalis</i>	RB	WGL/AGF	C	LC
167.	Chestnut-headed Bee-eater <i>Merops leschenaulti</i>	BV	MF/WGL	O	LC
168.	Blue-tailed Bee-eater <i>Merops philippinus</i>	BV	WGL/MF	C	LC
169.	Blue-bearded Bee-eater <i>Nyctyornis athertoni</i>	RB	WGL	U	LC
170.	Indian Grey Hornbill <i>Ocyeros birostris</i>	RB	MF/MC/WGL	C	LC
171.	Oriental Pied Hornbill <i>Anthraceros albirostris</i>	RB	MF/MC	O	LC
172.	Coppersmith Barbet <i>Xantholaema haemacephala</i>	RB	MF/MC	C	LC
173.	Brown-headed Barbet <i>Megalaima zeylanica</i>	RB	MF/MC	C	LC
174.	Eurasian Wryneck <i>Jynx torquilla</i>	WV	MF/WGL	U	LC
175.	Indian Pygmy Woodpecker <i>Dendrocopos nanus</i>	RB	MF/WGL/RF	O	LC
176.	Yellow-fronted Pied Woodpecker <i>Dendrocopos mahrattensis</i>	RB	MF/MC/RF/WGL	O	LC
177.	Scaly-bellied Woodpecker <i>Picus squamatus</i>	RB	MF/MC	U	LC
178.	Streaked-throated Woodpecker <i>Picus xanthopygaeus</i>	RB	MF/MC	U	LC
179.	Rufous Woodpecker <i>Micropternus brachyurus</i>	RB	MF/MC	U	LC

Table 1: Birds recorded in Suheldev Wildlife Sanctuary during the study (*contd.*)

S. No.	Species	Status	Habitat	Occurrence	Threat Category
180.	Himalayan Flameback <i>Dinopium shorii</i>	LM	MF/MC	O	LC
181.	Black-rumped Flameback <i>Dinopium benghalense</i>	RB	MF/MC/RF	C	LC
182.	Greater Flameback <i>Chrysocolaptes guttacristatus</i>	RB	MF/MC	O	LC
183.	Great Slaty Woodpecker <i>Mulleripicus pulverulentus</i>	RB	MC/MF	U	VU
184.	Oriental Skylark <i>Alauda gulgula</i>	RB	AGR	C	LC
185.	Bengal Bushlark <i>Mirafra assamica</i>	RB	AGR/WGL	C	LC
186.	Ashy-crowned Finch-lark <i>Eremopterix grisea</i>	RB	AGR/WGL	O	LC
187.	Grey-throated Sand-martin <i>Riparia chinensis</i>	RB	ML	C	LC
188.	Red-rumped Swallow <i>Cecropis daurica</i>	RB	ML	C	LC
189.	Wire-tailed Swallow <i>Hirundo smithii</i>	RB	ML	C	LC
190.	Barn Swallow <i>Hirundo rustica</i>	WV	ML	C	LC
191.	Western Yellow Wagtail <i>Motacilla flava</i>	WV	ML/AGR/MC	C	LC
192.	Grey Wagtail <i>Motacilla cinerea</i>	WV	ML/AGR	C	LC
193.	Citrine Wagtail <i>Motacilla citreola</i>	WV	ML/AGR/MC	C	LC
194.	White Wagtail <i>Motacilla alba dukhunensis</i>	WV	ML/AGR	C	LC
195.	White-browed Wagtail <i>Motacilla maderaspatensis</i>	RB	ML/AGR	C	LC
196.	Olive-backed Pipit <i>Anthus hodgsoni</i>	WV	GL	C	LC
197.	Richard's Pipit <i>Anthus richardi</i>	WV	GL	O	LC
198.	Paddyfield Pipit <i>Anthus rufulus</i>	RB	GL	C	LC
199.	Common Woodshrike <i>Tephrodornis pondicerianus</i>	RB	MF/WGL	O	LC
200.	Black-winged Flycatcher-shrike <i>Hemipus picatus</i>	RB	MF/RF/WGL	U	LC
201.	Black-winged Cuckooshrike <i>Lalage melaschistos</i>	WV	WGL/MF	U	LC
202.	Large Cuckooshrike <i>Coracina macei</i>	RB/LM	MF/MC/WGR/WGL	C	LC
203.	Long-tailed Minivet <i>Pericrocotus ethologus</i>	WV	MC/MF/RF	C	LC
204.	Scarlet Minivet <i>Pericrocotus speciosus</i>	WV	MC/MF	O	LC
205.	Small Minivet <i>Pericrocotus cinnamomeus</i>	WV	MC/MF	C	LC
206.	Red-vented Bulbul <i>Pycnonotus cafer</i>	RB	MF/MC/WGL/RF	C	LC
207.	Red-whiskered Bulbul <i>Pycnonotus jocosus</i>	RB	MF/MC/RF	C	LC
208.	Himalayan Bulbul <i>Pycnonotus leucogenys</i>	RB	MF	C	LC
209.	Black Bulbul <i>Hypsipetes leucocephalus</i>	LM	MF	O	LC
210.	Black-crested Bulbul <i>Pycnonotus flaviventris</i>	RB	MF	C	LC
211.	Common Iora <i>Aegithina tiphia</i>	RB	MF/MC	C	LC
212.	Gold-fronted Leafbird <i>Chloropsis aurifrons</i>	RB	MC/MF	O	LC
213.	'Black-headed' Long-tailed Shrike <i>Lanius schach</i> (tricolor group)	WV	WGL/AGR	C	LC
214.	'Rufous-backed' Long-tailed Shrike <i>Lanius schach</i> (erythronotus group)	WV	WGL/AGR	C	LC
215.	Great Grey Shrike <i>Lanis excubitor lahtora</i>	RB	WGL/WL/AGR	C	LC
216.	Grey-backed Shrike <i>Lanius tephronotus</i>	WV	WGL/AGR	O	LC
217.	Brown Shrike <i>Lanius cristatus cristatus</i>	WV	WGL/AGR	C	LC
218.	Isabelline Shrike <i>Lanius isabellinus</i>	WV	WGL	U	LC
219.	Bay-backed Shrike <i>Lanius vittatus</i>	RB	WGL/AGR	O	LC
220.	Orange-headed Thrush <i>Geokichla citrina</i>	WV	MF/RF/MC	C	LC
221.	Blue Whistling-thrush <i>Myophonus caeruleus</i>	LM	MF	U	LC
222.	Black-throated Thrush <i>Turdus atrogularis</i>	WV	MF/AGR	O	LC
223.	Small-billed Scaly Thrush <i>Zoothera dauma</i>	WV	MF/AGR	U	LC

Table 1: Birds recorded in Suheldev Wildlife Sanctuary during the study (*contd.*)

S. No.	Species	Status	Habitat	Occurrence	Threat Category
224.	Bluethroat <i>Luscinia svecica svecica</i>	WV	WL/AGR	O	LC
225.	White-rumped Shama <i>Copsychus malabaricus</i>	RB	MF/MC/RF	C	LC
226.	Oriental Magpie-robin <i>Copsychus saularis</i>	RB	MF/RF	C	LC
227.	Indian Black Robin <i>Copsychus fulicatus</i>	RB	WGL/AGR	C	LC
228.	Brown Rock-chat <i>Oenanthe fusca</i>	RB	AGR	C	LC
229.	Black Redstart <i>Phoenicurus ochruros rufiventris</i>	WV	WGL/AGR/MF	C	LC
230.	White-capped River-chat <i>Phoenicurus leucocephalus</i>	LM	Stream	U	LC
231.	Pied Bushchat <i>Saxicola caprata</i>	RB	WGL/AGR	C	LC
232.	Grey Bushchat <i>Rhodophila ferrea</i>	WV	WGL	U	LC
233.	Siberian Stonechat <i>Saxicola maurus</i>	WV	WGL/AGR	C	LC
234.	White-browed Fantail <i>Rhipidura aureola</i>	RB	MF/MC	C	LC
235.	White-throated Fantail <i>Rhipidura albicollis</i>	WV	MF/MC	C	LC
236.	Blue-naped Blue Monarch <i>Hypothymis azurea</i>	RB	MF/MC	O	LC
237.	Asian Paradise Flycatcher <i>Terpsiphone paradisi</i>	BW	MF/RF/MC	O	LC
238.	Red-breasted Flycatcher <i>Ficedula parva</i>	WV	MF/WGL/RF	C	LC
239.	Ultramarine Flycatcher <i>Ficedula superciliaris</i>	WV	MF	U	LC
240.	Tickell's Blue Flycatcher <i>Cyornis tickelliae</i>	WV	MF/RF	O	LC
241.	Verditer Flycatcher <i>Eumyias thalassinus</i>	WV	MF/MC	O	LC
242.	Yellow-eyed Babbler <i>Chrysomma sinense</i>	RB	WGL	O	LC
243.	Tawny-bellied Babbler <i>Dumetia hyperythra</i>	RB	WGL/MF	U	LC
244.	Common Babbler <i>Turdoides caudata</i>	RB	WGL/AGR	C	LC
245.	Striated Babbler <i>Turdoides earlei</i>	RB	GL	C	LC
246.	Large Grey Babbler <i>Turdoides malcolmi</i>	RB	AGR/MF	C	LC
247.	Jungle Babbler <i>Turdoides striata</i>	RB	MF/MC/AGR	C	LC
248.	Puff-throated Babbler <i>Pellorneum ruficeps</i>	RB	MF/MC	O	LC
249.	Striated Grassbird <i>Megalurus palustris</i>	RB	GL	C	LC
250.	Zitting Cisticola <i>Cisticola juncidis</i>	RB	GL	C	LC
251.	Ashy Prinia <i>Prinia socialis</i>	RB	GL/WGL/AGR	C	LC
252.	Plain Prinia <i>Prinia inornata</i>	RB	GL/WGL/AGR	C	LC
253.	Grey-breasted Prinia <i>Prinia hodgsoni</i>	RB	GL/WGL/AGR	U	LC
254.	Indian Reed-warbler <i>Acrocephalus [stentoreus] brunnescens</i>	WV	GL	U	LC
255.	Blyth's Reed-warbler <i>Acrocephalus dumetorum</i>	WV	GL	U	LC
256.	Common Tailorbird <i>Orthotomus sutorius</i>	RB	MF/WGL	C	LC
257.	Grey-headed Canary-flycatcher <i>Culicicapa ceylonesis</i>	WV	MC/MF	C	LC
258.	Smoky Leaf-warbler <i>Phylloscopus fuligiventer</i>	WV	WL/ MF	U	LC
259.	Greenish Warbler <i>Phylloscopus trochiloides</i>	WV	MF	O	LC
260.	Lesser Whitethroat <i>Sylvia curruca halimodendri</i>	WV	WGL/MF	C	LC
261.	Cinereous Tit <i>Parus cinereus</i>	RB	MF/MC/WGL	C	LC
262.	Indian Nuthatch <i>Sitta castanea</i>	RB	MF/MC/WGL	C	LC
263.	Thick-billed Flowerpecker <i>Dicaeum agile</i>	RB	MF/MC	O	LC
264.	Oriental White-eye <i>Zosterops palpebrosus</i>	RB	MF/MC	C	LC
265.	Purple Sunbird <i>Cinnyris asiaticus</i>	RB	MF/MC/WGL	C	LC
266.	Crimson Sunbird <i>Aethopyga siparaja</i>	RB	MF/MC	O	LC

Table 1: Birds recorded in Suheldev Wildlife Sanctuary during the study (*contd.*)

S. No.	Species	Status	Habitat	Occurrence	Threat Category
267.	Crested Bunting <i>Emberiza lathamii</i>	RB	WGL/AGR	C	LC
268.	Yellow-breasted Bunting <i>Emberiza aureola</i>	SM/WV?	AGR/GL	U	EN
269.	Black-headed Bunting <i>Emberiza melanocephala</i>	TWM	AGR	C	LC
270.	Red-headed Bunting <i>Emberiza bruniceps</i>	TWM	AGR	C	LC
271.	Common Rosefinch <i>Erythrura erythrura</i>	WV	AGR/MF	O	LC
272.	Red Avadavat <i>Amandava amandava</i>	RB	GL/WGL/AGR	C	LC
273.	Chestnut Munia <i>Lonchura atricapilla</i>	1 record	GL/AGR	U	LC
274.	Tricoloured Munia <i>Lonchura malacca</i>	BV	GL/AGR	C	LC
275.	Indian Silverbill <i>Euodice malabarica</i>	RB	GL/WGL/AGR	U	LC
276.	Scaly-breasted Munia <i>Lonchura punctulata</i>	RB	GL/WGL/AGR	C	LC
277.	House Sparrow <i>Passer domesticus</i>	RB	GL/WGL/AGR	C	LC
278.	Yellow-throated Sparrow <i>Gymnoris xanthocollis</i>	RB	GL/WGL/AGR	C	LC
279.	‘Indian’ Baya Weaver <i>Ploceus philippinus philippinus</i>	RB	GL/WGL/AGR	C	LC
280.	Streaked Weaver <i>Ploceus manyar</i>	RB	GL/WGL/AGR	U	LC
281.	Black-breasted Weaver <i>Ploceus benghalensis</i>	RB	GL/WGL/AGR	C	LC
282.	Indian Golden Oriole <i>Oriolus kundoo</i>	BV	MF/WGL/RF	O	LC
283.	Black-hooded Oriole <i>Oriolus xanthornus</i>	RB	MF/MC/WGL	C	LC
284.	Black Drongo <i>Dicrurus macrocercus</i>	RB	MC/WGL	C	LC
285.	Ashy Drongo <i>Edolius leucophaeus</i>	WV	MC/MF	U	LC
286.	White-bellied Drongo <i>Edolius caeruleus</i>	RB	MC/MF/RF/WGL	C	LC
287.	Greater Racket-tailed Drongo <i>Dicrurus paradiseus</i>	RB	MC/MF/RF	C	LC
288.	Hair-crested Drongo <i>Dicrurus hottentottus</i>	RB	MC/MF	C	LC
289.	Grey-headed Starling <i>Sturnia malabarica</i>	RB	MF/WGL	C	LC
290.	Brahminy Starling <i>Sturnia pagodarum</i>	RB	MF/WGL/AGR	C	LC
291.	Asian Pied Starling <i>Gracupica contra</i>	RB	WGL/MF	C	LC
292.	Bank Myna <i>Acridotheres ginginianus</i>	RB	AGR/GL	C	LC
293.	Common Myna <i>Acridotheres tristis</i>	RB	AGR/WGL	C	LC
294.	Jungle Myna <i>Acridotheres fuscus</i>	RB	MF	C	LC
295.	House Crow <i>Corvus splendens</i>	RB	AGR/WGL/MF	C	LC
296.	Jungle Crow <i>Corvus [macrorhynchos] culminatus</i>	RB	AGR/MF/MC	C	LC
297.	Red-billed Blue Magpie <i>Urocissa erythrorhyncha</i>	LM	MF	U	LC
298.	Rufous Treepie <i>Dendrocitta vagabunda</i>	RB	MF/MC/WGL	C	LC

Abbreviations:
RB - year-round resident, WV - winter visitor, BV - breeding visitor, LM - local migrant, SM - spring migrant, FM - fall migrant, TWM - two-way migrant; MF - mixed forest, WL - wetland, MC - sal or teak forest, ML - marshland, RF - riparian forest, GL - grassland, AGR - agricultural crop fields on forest edges, WGL - wooded grassland;
C - Common (C = seen frequently, more than 10 sightings), O - Occasional (O = less than 10 sightings), Uncommon (U = less than 5 sightings, and irregularly seen); CR - Critically Endangered, EN - Endangered, VU - Vulnerable; NT - Near Threatened, LC - Least Concern.

*Note: Status grouping was done based on our year-long observations, along with previous published sources and information gathered from researchers. Wetland and marshland species are mostly clumped together as ML/WL because of the difficulty in delineating the habitat boundaries for certain species. Special emphasis was given to globally threatened species such as vultures, storks, and cranes. The level of threat for each species is based on the list prepared by BirdLife International for IUCN.

Sohelwa ranges, mostly around Hathiakunda and Bhainsahi stream, between August 2010 and February 2011; over 70 birds sighted on a tree from Navashahr beat in Tulsipur range in January 2012; and a mixed flock of more than 100 vultures near Bankatwa during early 2013.

Red-headed Vulture *Aegypius calvus*

Only one confirmed sighting of this species was obtained from Hathiakunda nullah on April 01, 2015 (Anand Singh *in litt.* 2015).

ENDANGERED

Egyptian Vulture *Neophron percnopterus*

During the survey, 27 Egyptian Vultures were sighted, solitary or in twos or threes, sometimes in the company of other vultures, in almost all the ranges, particularly in East Sohelwa, West Sohelwa, Tulsipur, and Rampur.

Black-bellied Tern *Sterna acuticauda*

Around 25–30 Black-bellied Terns were recorded in East Sohelwa range at Rampur Bandh during the second week of April 2014. Other than this, one or two individuals were recorded in the Bhambhar and Rampur ranges during the same period.

Yellow-breasted Bunting *Emberiza aureola*

The Yellow-breasted Bunting is listed as Vulnerable because its population has undergone a rapid decline mainly due to trapping in the wintering grounds (BirdLife International 2014). Nearly 200 Yellow-breasted Buntings were sighted during the last week of March 2014 in the Rampur Range, near the Chittaurgarh Dam before Suga-nagar Dumri. These buntings were mostly seen foraging in fallow fields in the morning and evening with munias and weaverbirds. During the day, they were observed resting in *Arundo* and *Ipomea* vegetation at the edges of the Chittaurgarh Dam. These birds were perhaps on their way to the wintering grounds as they were not recorded during any other season. In Uttar Pradesh, Yellow-breasted Bunting has earlier been reported only from Dudhwa (Rahmani *et al.* 2014).

VULNERABLE

Asian Woollyneck *Ciconia episcopus*

The species was seen in most of the ranges in low numbers. A maximum of seven birds was recorded during April 2014 near Rampur Bandh in East Suheldev, while solitary birds or twos or threes were recorded around the

Kohargaddi, Baghelkhand, and Chittaurgarh reservoirs on more than one occasion.

Common Pochard *Aythya ferina*

The Common Pochard has been uplisted as Vulnerable in 2016 (BirdLife International 2016). In Suheldev, the Chittaurgarh Reservoir in Rampur Forest Range is a haven for waterfowl, including Common Pochard. This species was also seen in good numbers (*c.* 80–100) in winter in Suga-nagar Dumri, a wetland formed from the spillage of the Chittaurgarh Dam.

Lesser Adjutant *Leptoptilos javanicus*

In the first week of April 2014, only one individual was recorded in the buffer zone near Semra, the headquarters of Bhambhar Range. It is regularly seen in the terai region, and breeding has been recorded from Dudhwa National Park (Javed and Rahmani 1988). It is quite common in and around Sohagi Barwa Wildlife Sanctuary (Rahmani *et al.* 2015).

Indian Spotted Eagle *Clanga hastata*

A bird was recorded near Baghelkhand reservoir in Tulsipur Range on February 10, 2014. However, this record needs verification due to the lack of good photo-evidence, and remains unconfirmed.

Greater Spotted Eagle *Clanga clanga*

Only one (unconfirmed) record of this species was obtained in January 2014 from Baghelkhand reservoir.

Sarus Crane *Grus antigone*

Uttar Pradesh currently harbours nearly 50% of India's Sarus Crane population. Despite our best effort to locate the species in and around Suheldev Wildlife Sanctuary, only five Sarus Cranes were recorded during our surveys. The records comprise a pair with a juvenile in Rampur Banda and another pair at the outskirts of East Sohelwa in April 2014. We estimate a population of not more than 10 birds in the area. There are good populations of Sarus Crane on the way to Sohagi Barwa Wildlife Sanctuary (from Suheldev), especially in and around Siddharthnagar (Bhargava and Singh 2014).

Great Slaty Woodpecker *Mulleripicus pulverulentus*

The large patches of old sal forest in the core areas of Suheldev offer excellent habitat for the Great Slaty Woodpecker. During our line transect sampling in Mansurwa beat of Rampur range, we encountered this resident species twice in the buffer zone. During January 2014, we sighted 3–5 birds, and again recorded 9–10 birds including four juveniles with the adults from the same area in October. In East Sohelwa,

a group of five birds was recorded in July 2014, 3 km from the Forest Rest House on the SSB Road, Bhaisahinaka. We also heard its call near Sonpatri Ashram in October 2014.

In Uttar Pradesh, the Great Slaty Woodpecker is mainly found in the mature sal forests of Dudhwa National Park, Katarniaghat Wildlife Sanctuary, Kishanpur Wildlife Sanctuary, and Pilibhit Reserve Forest (Rahmani 2012; Rahmani *et al.* 2014).

NEAR THREATENED

Oriental Darter *Anhinga melanogaster*

The Oriental Darter was recorded in most wetlands of the Sanctuary. In certain seasons, up to 20 birds were counted roosting around the Chittaurgarh Dam before Suga-nagar Dumri in Rampur and also at Rampur reservoir in East Sohelwa range during our monthly waterfowl census. We recorded a total of 40 birds along with other cormorants during our visits. There is also a good population of this species (>30) in the wetlands of the neighbouring Bhinga Range (not part of Suheldev Wildlife Sanctuary).

Painted Stork *Mycteria leucocephala*

More than a dozen Painted Storks were recorded from east Sohelwa Range in Rampur Bandha in April 2014. A few solitary or 2–3 birds were also recorded at various dams.

Black-necked Stork *Ephippiorhynchus asiaticus*

A pair each was recorded from the water bodies of Rampur Bandha and Razia Taal of East Sohelwa Range in April 2014.

Black-headed Ibis *Threskiornis melanocephalus*

This species was frequently recorded around Baghelkhand reservoir, Rampur and Chittaurgarh dams. Eight to ten birds were encountered during the visits.

Ferruginous Duck *Aythya nyroca*

We recorded less than 10 Ferruginous Ducks, along with pochards, at Chittaurgarh dam near Suga-nagar Dumri during the winter waterbird surveys in December 2013.

Falcated Duck *Mareca falcata*

This species was recorded in Bhagwanpur Bandh, in Tulsipur Range during January 2017 (Sharad Gaur, *in litt.* 2017).

Lesser Fish-Eagle *Ichthyophaga humilis*

One or two Lesser Fish-Eagles were regularly recorded at Razia Taal in East Sohelwa range. It probably breeds in the

Sanctuary. In Uttar Pradesh, the Lesser Fish-Eagle is reported from Dudhwa, and is likely to occur in Katarniaghat and Kishanpur, and probably also North Pilibhit Reserve Forests (Rahmani *et al.* 2014).

Grey-headed Fish-Eagle *Ichthyophaga ichthyaetus*

The Grey-headed Fish-Eagle was recorded at Razia Taal, East Sohelwa in the first week of April 2014. Due to identification difficulties between this species and the Lesser Fish-eagle *I. humilis*, there is a possibility of either of the species being misidentified.

Himalayan Griffon *Gyps himalayensis*

This species was encountered throughout the surveys during winter, seen feeding with other vulture species. We recorded between 80 to 100 individuals from almost all ranges of the Sanctuary. Around 40 to 50 birds were seen in the Bhambar, Rampur, West and East Sohelwa ranges.

Cinereous Vulture *Aegypius monachus*

We recorded three individuals on three occasions in the East and West Sohelwa ranges during February 2014, along with other vulture species.

Pallid Harrier *Circus macrourus*

The Pallid Harrier was recorded twice in January 2014, in and around agricultural fields between the East and West Sohelwa ranges.

Red-headed Falcon *Falco chicquera*

The Red-headed Falcon was occasionally recorded in most of the ranges of Suheldev Wildlife Sanctuary, mainly near open areas adjacent to wetlands.

River Lapwing *Vanellus duvaucelii*

The River Lapwing was regularly recorded, especially around wetlands of East Sohelwa range. During most of our monthly waterbird surveys, we recorded 5 or 6 birds around the Rampur wetlands. The species was also recorded at the Kohargaddi, Vanghohwa, Girgitahi, and Baghelkhand reservoirs.

River Tern *Sterna aurantia*

The River Tern was seen in and around the various reservoirs and wetlands, flying singly or in group of 3–4 birds

Ashy-headed Green-pigeon *Treron phayrei*

The species was recorded from five ranges on several occasions, and was especially sighted in early summer when the birds engage in courtship display. The majority of

the sightings were in mixed forest patches in the Jarwa and Mansurwa forest beats of Rampur Range, and also in most forest patches of West Sohelwa, East Sohelwa, Bankatwa, and Barhawa ranges.

Alexandrine Parakeet *Psittacula eupatria*

The Alexandrine Parakeet was recorded in all the ranges of the Sanctuary, nesting especially in mixed forest of old trees.

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REVIEWS

1. FLORA OF THE SOUTHERN WESTERN GHATS AND PALNIS – A FIELD GUIDE by Pippa Mukherjee. 2016. Published by Niyogi Books, New Delhi, India. Size: 23 cm x 15 cm. 488 pp. Price: Rs. 1,250/- (\$ 25). Paperback.
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As an environment enthusiast, nature lover, and founder member of Palni Hills Conservation Council, Ms Pippa Mukherjee has written extensively on gardening, health, and environment and also has two books to her credit, COMMON TREES OF INDIA and TREES OF INDIA. Here comes the third one, FLORA OF THE SOUTHERN WESTERN GHATS AND PALNIS – A FIELD GUIDE, which includes trees, shrubs, and herbs, with a few conifers and ferns. In this attempt, she has been ably helped by Bob Stewart and Tanya Balcar with their inputs and Kannan with his invaluable knowledge on the uses of plants.

This field guide provides information on both indigenous and exotic species found in the hill ranges of Southern Western Ghats and Palni hills. It contains a total of 197 species, of which 63% are indigenous and the rest exotic. It is divided into three sections, namely, Trees (includes 60 species), Shrubs & Climbers (72 species), and Herbs (65 species). Each species is described with its botanical name, family, English name, local name, distribution, description, phenology, and uses.

In the beginning, a map of the Southern Western Ghats and one of the hill ranges of Kodai area are provided. Earlier floristic works, right from 1915, and historical details from Megalithic times till date, have also been provided. The book talks about the foreigners who developed these biodiverse areas as hill stations and the effects of anthropogenic activities

on sholas and grasslands, a unique ecosystem in the Western Ghats. Thus there is a need for conservation of these areas, which have endemic, rare, and endangered species of flora and fauna. Additional information and notes are also provided for each species, which includes information on other species of that genus, importance of that species in the ecosystem, mainly in shola forest, and if it is an introduced species then whether it is invasive or grown in garden, households, and for commercial purposes.

In each section, species are arranged alphabetically and a colour photograph is provided. Line drawings of all the species, leaf shapes, and a glossary of botanical terms are provided towards the end.

A few of the colour photographs are not clear. Photographs of *Ziziphus oenoplia*, *Cestrum diurnum*, and *Centella asiatica* are wrongly identified. *Ficus pumila* is a climbing shrub; it should be included in the Shrubs & Climbers section, rather than in the Herbs section. *Ziziphus oenoplia* is a straggling shrub; it should be in the Shrubs & Climbers section rather than in the Tree section. The header label on p. 153 is wrong.

To sum up, it is a good book for common people and visitors to that area, to refer and use as a field guide.

■ Rajendra Shinde

2. DICTIONARY OF LOCAL-BOTANICAL NAMES IN INDIAN FOLK LIFE by Vartika Jain and S.K. Jain. 2017. Published by Scientific Publishers, India. Size: 24 cm x 18 cm. 336 pp. Price: Rs. 1,950/-. Hardbound.
doi: 10.17087/jbnhs/2016/v113/119673

This is a book that anyone working on ethnobotany and anthropology in India should possess, as it contains 26,000 local names and relevant botanical names of plants. As the authors write in the Preface, “About a hundred books have been published in Indian ethnobotany in the last three or four decades, most of them are descriptive, dealing with concept, definition, scientific and economic importance of the subject. Many field workers often do not attach much importance to local names and sometimes don’t even record them.”

This book has compiled local names from the authors’ own field work, and has listed 1,200 research papers and books published in the last six decades. It is a compilation of large numbers of tribal and rural local names of plants from every part of India, including Andaman & Nicobar.

Anyone who has worked in the field in ecology, either animal or plant, will vouch for the importance of local knowledge. Most tribal and rural people have names of species that are of economic, medicinal, or ecological importance.

Many times local knowledge can lead to discovery of new taxa, or new economic use of a species. Often a species may have two or three names, within a limited geographic area, or more often, closely related species have a common local name. For example, *Cordia dichotoma* and *Cordia myxa* are both called Lasora (p. 180). Sometimes unrelated species may have a similar name, e.g. Kadai is *Albizia lebbeck*, *Firmiana simplex*, and *Xylia xylocarpa* (p. 127). Kamraj is the local name for seven species (p. 135). The only drawback of the book is that it does not give the geographical area/region where a name is prevalent. Perhaps in the second edition of the book this major lacuna will be rectified.

The authors have rightly written that etymological

studies on local names show cultural richness of indigenous communities and their understanding of flora. With the rapid disappearance of native languages, there is real danger that much of our folk knowledge will also disappear. It is time we quickly document local names of plants and their uses before this knowledge is lost in the name of economic development. This book is a useful compendium in that direction. I recommend it to all institutions and universities where ecological work is being carried out. Even pharmaceutical companies will find this book useful as many commercial drugs originate from local knowledge of medicinal value of plants.

■ Asad R. Rahmani

MISCELLANEOUS NOTES

1. RECENT RECORD OF INDIAN GREY WOLF *CANIS LUPUS PALLIPES* SYKES, 1831
IN ALIGARH DISTRICT, UTTAR PRADESH, INDIAKHURSID A. KHAN¹¹Department of Wildlife Sciences, Aligarh Muslim University, Aligarh 202 001, Uttar Pradesh, India.

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The Indian Grey Wolf *Canis lupus pallipes* was historically distributed in Aligarh district (Uttar Pradesh) of India (Atkinson 1875). However, its occurrence was uncertain in the past (Hunter 1909; Shahi 1982) and was considered locally extirpated from Aligarh district (Satish Kumar pers. comm. 2014).

A sighting of the Grey Wolf was recently recorded in Muzaffarnagar district, where it severely injured 11 people (PTI 2014). On the morning of June 03, 2014, a female wolf *Canis lupus pallipes* was sighted and photographed in a *Prosopis juliflora* plantation (27° 57' 16" N; 78° 19' 16" E) near Gazipur village, in Atrauli tehsil of Aligarh district. Gazipur village is situated about 30 km north-east of the district headquarters. This constitutes a recent photographic record of the Indian Grey Wolf in Aligarh district of Uttar Pradesh.

The wolf was differentiated by its larger size, slim body, big head with long muzzle, arching brow, elevated forehead, and long limbs in comparison to other members of Canidae. The Golden Jackal *Canis aureus* is the closest relative of Indian Grey Wolf but it is smaller in build and “meaner in aspect” (Prater 2005). An adult wolf weighs about 17 to 25 kg, with height of 57 to 72 cm and length about 103 to 145 cm, while the Golden Jackal is 8–11 kg in weight and about 60–75 cm in length, with a more slender build, a sharper muzzle and a shorter tail. The coat of Grey Wolf is sandy fawn stippled with black, while the Golden Jackal is a mix of black and white, washed with buff about the shoulders, ears, and legs.

The Golden Jackal's winter fur also differs from the wolf's

by its more fulvous-reddish colour (Jhala 2003; Menon 2014; Prater 2005).

The Indian Grey Wolf is distributed in western Uttar Pradesh in parts of Jhansi, Etawah, Mainpuri, Firozabad, Farrukhabad, and Etah districts (IUCN 2015), and in eastern Uttar Pradesh in Sultanpur, Pratapgarh, Raibareli, and Jaunpur districts (Jhala and Sharma 1997). The small patches of *Prosopis* plantation across its distributional range in Uttar Pradesh are preferred by the Indian Grey Wolf, possibly as these plantations besides serving as dumping ground of carcass from villagers, have ample prey for the wolf such as Blackbuck *Antelope cervicapra*, Nilgai *Boselaphus tragocamelus*, Rufous-tailed Hare *Lepus nigricollis ruficaudata*, Indian Bush Rat *Golunda ellioti*, and free ranging stray cattle.

Indian Grey Wolf has almost disappeared from Aligarh and its surroundings (Satish Kumar pers. comm. 2014). This needs to be further investigated by conducting more surveys to know the status and distribution of Indian Grey Wolf in Aligarh district for effective management and conservation of this species and its habitat.

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2. FIRST PHOTOGRAPHIC (CAMERA TRAP) EVIDENCE OF TIBETAN WOLF *CANIS LUPUS CHANCO* IN THE UTTARAKHAND HIMALAYA, INDIA

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Historically, wolves had the largest and most extensive range of all mammals, second only to humans (Srivastav and Nigam 2009). Their former range included most of the countries in Europe, most of northern Russia, parts of the

Middle East, India, and Nepal (Srivastav and Nigam 2009). Though their distribution and populations have severely reduced, wolves were once distributed throughout the northern hemisphere (Feldhamer *et al.* 2003; Mech 1970). They are

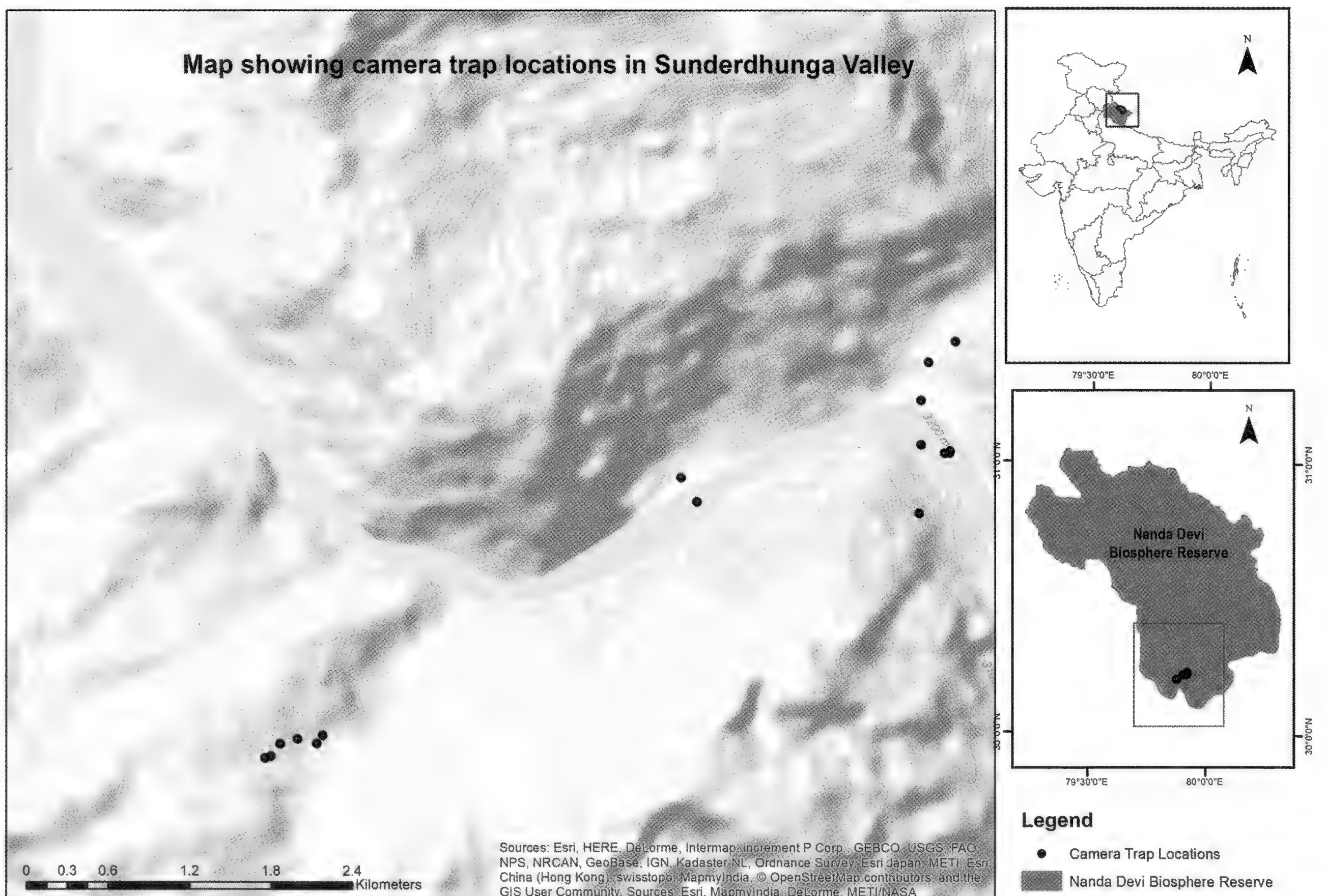


Fig. 1: Sites of Tibetan Wolf capture at Sunderdhunga valley, Bageshwar



Fig. 2: Camera trap image of Tibetan Wolf *Canis lupus chanco*

nearly extinct throughout most of western Europe, with a few stable populations extant in Spain, Italy, Poland, Russia, Greece, and Turkey (Srivastav and Nigam 2009). Most of the reports of wolf presence in the Himalaya have appeared from

the Trans-Himalayan landscape across India, Tibet, and Nepal (Chundawat 1992; Chundawat and Qureshi 1999; Chanchani *et al.* 2011; Fox *et al.* 1986; Hodgson 1847; Jackson *et al.* 1996; Maheshwari and Sharma 2010; Pocock 1941). In 2010, Bhattacharya and Sathyakumar sighted the Tibetan wolf in Nanda Devi Biosphere Reserve, where small portions of the Trans-Himalaya are found in Uttarakhand, in Nanda Devi Biosphere Reserve (NDBR) and Gangotri National Park (NP). The presence of Tibetan Wolf in Ladakh, Lahaul and Spiti, and northern Sikkim, along with information on livestock depredation has been well-documented (Chundawat 1992; Chundawat and Qureshi 1999; Fox *et al.* 1986, 1991; Jayapal 2000; Sathyakumar and Qureshi 2003).

We carried out continuous sampling in the buffer zone of Nanda Devi Biosphere Reserve in the Bageshwar district of Uttarakhand, using 16 camera traps during a snow leopard survey conducted by Uttarakhand State Forest Department under the guidance of Chief Conservator of Forest (Kumaon Zone, Nainital) in November–January, 2013.



Fig. 3: Camera trap images: a: Musk Deer, b: Himalayan Tahr, c: Himalayan Serow, d: Yellow-throated Marten

The Nanda Devi Biosphere Reserve (NDBR) extends from 30° 17' N to 30° 41' N and from 79° 40' E to 80° 05' E and covers an area of 624.62 sq. km core zone and 1,612.12 sq. km buffer zone. NDBR is a well-known biodiversity hotspot in the Himalayan region. The Reserve supports over 1,000 species of plants including bryophytes, fungi, and lichens and about 520 species of fauna including mammals, birds, reptiles, amphibians, fishes, insects, molluscs, and annelids (Samant 2001). Average temperature ranges between 14–24 °C in summer to 7.5–3 °C in winter respectively.

We obtained a camera trap photograph of *Canis lupus chanco* from Sunderdhunga valley (Fig. 2) at 30° 13' 48" N, 79° 54' 57" E and at an altitude of 3,298 m (Fig. 1). The area is rich in prey species for predators (Tibetan Wolf and Snow Leopard). In addition, the team recorded sightings and camera trap photographs of Himalayan Tahr, Musk Deer, Himalayan Serow, and Yellow-throated Marten (Fig. 3 a-d).

To the best of our knowledge, this is the first camera trap record of Tibetan Wolf in Kumaon Himalaya from the buffer zone of NDBR in the Bageshwar district of Uttarakhand. It is recommended that extensive field surveys should be carried out in similar habitats in the Kumaon Himalaya region, using

camera traps and DNA sampling (from scats) to confirm the presence of the Tibetan Wolf in Kumaon Himalaya. Also open and close handed questionnaire surveys should be carried out for shepherds and villages of transition zone of Himalaya to investigate the extent of local knowledge about the presence of wolf and their attitude towards wolf presence. Such survey data will be of great significance in enhancing our understanding of a possible range extension of this species, and has implications for conservation and management.

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3. FIRST PHOTOGRAPHIC EVIDENCE OF INDIAN PANGOLIN *MANIS CRASSICAUDATA* E. GEOFFROY, 1803 IN MUKUNDARA HILLS TIGER RESERVE (MHTR), RAJASTHAN, INDIA

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Indian Pangolin, also known as Scaly Ant-eater because of its myrmecophagous diet and presence of large overlapping scales on the body, is a medium-sized solitary mammal found widely across the Indian subcontinent (Heath 1995; Prater 1980; Tikader 1983). Although widely distributed, the population status and local distribution of the species is scarcely known (Baillie *et al.* 2014; CITES 2000). Only a few studies have been conducted in zoos (Mohapatra and Panda 2013; Pattnaik 2008) and sporadic notes have appeared, depicting the species' presence in local sites (Hutton 1949; Mishra and Panda 2011; Murthy and Mishra 2010; Saxena 1986; Singh 1994). However, increasing market demands (national and international trade), as well as rapid habitat loss and local hunting, have caused a significant decline in Indian Pangolin population throughout its range (Baillie *et al.* 2014; Broad *et al.* 1988; Mahmood *et al.* 2012). Illegal hunting of pangolin for scales (for medicinal and ornamental purposes) and meat (local source of protein) poses a grave threat to the species (Baillie *et al.* 2014; Broad *et al.* 1988; Mishra and Hanfee 2000). Biological traits of Indian Pangolin, like low-density occurrence and low reproductive vigour, make them vulnerable to these ever increasing threats (Mishra and Panda 2011). Considering its susceptibility, the species has been included in the 'Endangered' category of the IUCN RedList (Baillie *et al.* 2014; Murthy and Mishra 2010), and listed in Appendix II of CITES to ban all kinds of international trade (CITES 2000).

Mukundara Hills Tiger Reserve (hereafter MHTR), situated in the south-eastern part of Rajasthan, India, comprises Darrah Wildlife Sanctuary, Jawahar Sagar Wildlife Sanctuary, and Chambal Wildlife Sanctuary. The dry deciduous forest tracts of MHTR are dominated by *Anogeissus pendula*, *A. latifolia*, *Acacia catechuoides*, *A. leucophloea*, *Aegle marmelos*, *Ziziphus mauritiana*, and *Flacourtia indica* (Champion and Seth 1968). MHTR harbours a diverse carnivore assemblage that includes Leopard, Indian Wolf, Sloth Bear, Hyena, Honey Badger, Jungle Cat, Desert Cat, Indian Fox, and the wild ungulate species include Chital, Sambar, Nilgai, and Chinkara.

In a recent survey on 'Monitoring of tiger, co-predator, prey, and their habitat' (Phase III. For details, see Jhala *et al.* 2015), a total of 104 camera traps were placed in MHTR, covering an area of 59 sq. km (Fig. 1). Total trapping effort was 1,771 trap nights. During the camera trapping session, a pangolin was photo-captured in a digital camera trap on December 13, 2014, at 4:35 am (Fig. 2). The camera (camera trap ID-17, 24° 59' 49.3" N and 75° 38' 11.3" E) was deployed on a mud road on Seljar plateau top, in the

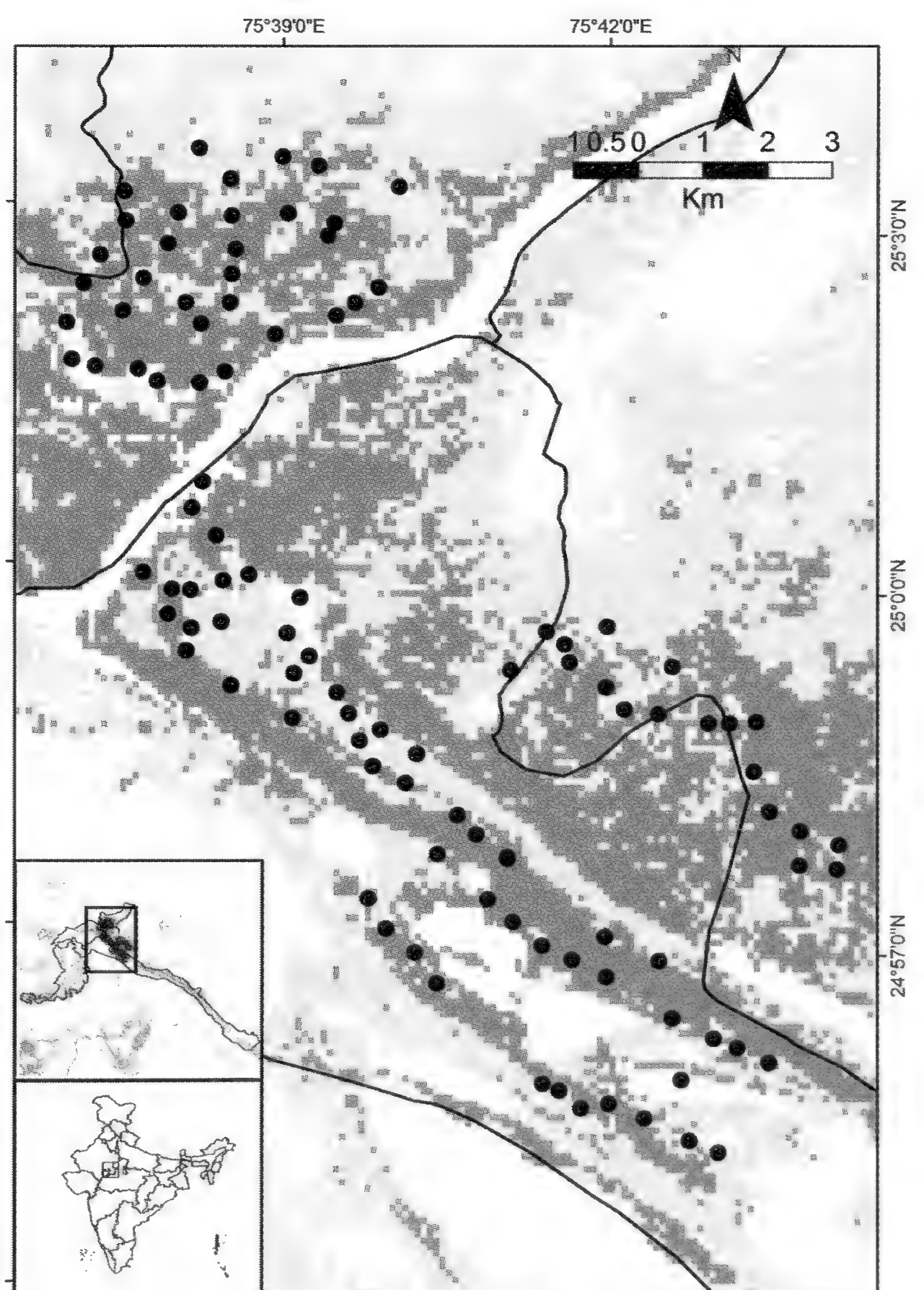


Fig.1: Camera trap placement (black dots) in Mukundara Hills Tiger Reserve. Inset: Location of Mukundara Hills Tiger Reserve in India



Fig. 2: Camera trap photograph of Indian Pangolin in Mukundara Hills Tiger Reserve

north-western part of MHTR. The camera trap was kept 30 cm above the ground to maximize capture of small as well as large mammals present in the area. This particular forest patch was dominated by *Anogeissus pendula* and *Acacia*

catechuoides, and the terrain was flat. Seljar area experiences lower anthropogenic pressure in comparison with other parts of MHTR, and this plateau acts as a refuge for the remaining wildlife species present in this human dominated landscape.

This was the first photographic evidence of Indian Pangolin from MHTR and its adjoining forested areas. Confirmed records of Indian Pangolin are very rare due to its low density occurrence and elusive nature (Baillie *et al.* 2014). Out of 104 camera trap points and 1,771 nights of camera trapping in MHTR (camera trapping efforts were of 13 trap nights at camera trap point 17 where the pangolin was photo-captured), the species was photographed only once. Although listed in Schedule I of Indian Wildlife (Protection) Act 1972 and Appendix I in CITES, Indian Pangolin faces a high risk of extinction primarily due to poaching and habitat loss (Baillie *et al.* 2014; CITES 2000; Murthy and Mishra 2010; Wu *et al.* 2002). The presence of the species in MHTR is encouraging enough to conduct a solemn investigation to understand ecology, especially abundance and habitat use of the elusive and Endangered Indian Pangolin for its long-term conservation.

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4. INDIAN POND-HERON *ARDEOLA GRAYII* SCAVENGING ON LITTLE CORMORANT *MICROCARBO NIGER*

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The Indian Pond-Heron or Paddybird *Ardeola grayii* is a small heron belonging to the Ardeidae family. Its feeding ground is mainly marshy areas, and floating vegetation used to access food from deep water. Kallettumkara Heronry (10° 20' 26.50" N; 76° 16' 49.93" E) is one of the largest heronries in Kerala (Ajitha and Jose 2015). While counting the nests in the heronry on July 19, 2016, a breeding Indian Pond-Heron was found scavenging on young Little Cormorant *Microcarbo niger* which was lying dead on the ground. A flock of 12 Indian Pond-Heron were competing for the prey and at last one of them took the alimentary canal from the carcass and consumed it within four seconds. Usually herons are carnivores associated with wetlands and water, and feed on a variety of live aquatic prey. Standing and waiting for prey and sometimes stalking the prey are the usual feeding techniques adopted by herons (Kushlan 2011).

Heron diet includes fish, reptiles, amphibians, crustaceans, molluscs, and aquatic insects. Indian Pond-Heron mainly feeds on fish (Kirkpatrick 1953), as well as crustaceans, aquatic insects, dragonflies (Santharam 2003), bees (Prasad and Hemanth 1992), tadpoles and sometimes leeches (*Herpobdelloides* sp.) (Mathew *et al.* 1978). The present observation of Indian Pond-Heron scavenging on Little Cormorant was not reported earlier.

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5. FLOATING BEHAVIOUR OF ASIAN OPENBILL STORK *ANASTOMUS OSCITANS*

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The Asian Openbill Stork *Anastomus oscitans* is a large wading bird of the stork family Ciconiidae. While conducting studies on foraging behaviour of birds in Kole wetlands of Thrissur, Kerala (10° 20'–10° 40' N; 75° 58'–76° 11' E), on April 18, 2016, Asian Openbill Stork was seen floating in a

small stream (water depth 74 cm) (Fig. 1) in Pullu Kole (10° 28' 10.47" N; 76° 9' 2.47" E). It continued to float for about 24 minutes. The temperature recorded that day was 33° C and it was assumed that the bird was floating in order to withstand the high ambient temperature. Unfeathered body



Fig. 1: Floating behaviour of Asian Openbill Stork

surfaces serve as important sites for heat exchange with the environment and usually heat conduction occurs between the bird's body and the substrate where the bird rests. Similar floating behaviour of Indian Pond Heron was observed by Neelakantan (1986). Foraging (Kahl 1971), nesting (Datta and Pal 1993), breeding (Mukhopadhyay 1980), and locomotory behaviour (Kahl 1972) of Asian Openbill Stork was described by earlier workers, but floating behaviour has not been recorded so far.

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6. BREEDING OF RUDDY SHELDUCK *TADORNA FERRUGINEA* (PALLAS) (ANATIDAE: ANSERIFORMES) FROM CHANDERTAL WETLAND IN HIMACHAL PRADESH, INDIA

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Introduction

The breeding of Ruddy Shelduck *Tadorna ferruginea*, also known as Brahminy Shelduck, is so far reported from Ladakh (Pfister 2004), Arunachal Pradesh (Choudhury 2000), and Sikkim (Ganguli-Lachungpa 1990). The global abundance of Ruddy Shelduck has declined drastically in recent decades (Zu-Kui *et al.* 2013). In Himachal Pradesh, Ruddy Shelduck has also been observed in Pong dam in winter, commencing its arrival in September, but no breeding has been reported from the state.

Chandertal, a freshwater wetland, also called 'the lake of the moon' because of its crescent shape, is located at an altitude of 4,290 m above sea level, near the Kunjam Pass which connects the Great Himalayan and Pir Panjal ranges. It has been designated as a 'Wetland of International Importance'

under the Ramsar Convention due to the presence of rare plant species and a wide range of unique animal species.

Ruddy Shelduck *Tadorna ferruginea* (Pallas) was observed as a large orange-brown duck with a pale head and neck with a faint black collar at its base. Female was similar to male, but lacked the black collar ring and had a less pale head.

Its nesting season is from April to June in Ladakh, Nepal, and Tibet. Its nest is a thick pad of down feathers in holes in cliffs or in a building, often at a considerable distance and height from water. It lays 6 to 10 eggs, which are pearly white with smooth texture.

A pair in and around Chandertal was recorded with seven ducklings from July 24–28, 2015. The Ruddy Shelduck has been observed in the Chandertal wetland by earlier workers, but it is the first breeding record of this duck from the wetland.

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7. SIGHTING OF THE FERRUGINOUS DUCK *AYTHYA NYROCA* IN ADILABAD DISTRICT, TELANGANA STATE, INDIA

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The Ferruginous Duck *Aythya nyroca* is a medium-sized diving duck found in the Eurasian region. Very distinctively coloured, the adult male is a rich chestnut colour with a darker back and a glaring yellow-white eye. The white underbelly and pure white undertail helps to distinguish this species from the somewhat similar Tufted Duck. The female is similar to the male, but somewhat duller, and with a dark eye. Juveniles are similar but the belly and undertail are grey-buff. In flight, a broad white wingbar extends onto the outer primaries. It is easily distinguished from other similar ducks by the white undertail when sitting and the extensive wingbar in flight. They are gregarious birds, forming large flocks in winter, often mixed with other diving species such as Tufted Duck and Common Pochard. Four main populations are recognized and migration occurs from early September to mid-October, whilst breeding grounds are reoccupied from mid-March to early May. Their normal breeding habitat is in marshes and lakes with a metre or more of water depth. The European population breeds in southern and eastern Europe and southern and western Asia. The main part of the population occurs in Asia, where there is much suitable habitat and it remains common, although quantitative data is lacking (BirdLife International 2016).

On January 24, 2016, during the AWC (Asian Waterbird Census) in Adilabad district (Telangana State), SB, LM, and HK sighted five Ferruginous Ducks in a small tank (19° 5'

54.3372" N; 78° 46' 55.4916" E) close to the Nirmal-Jannaram main road. The tank in which the birds were sighted was about one metre deep, with good growth of water lilies and other aquatic plants. The birds were observed staying in a more open part of the tank, where the water lily leaves were less dense. Although the Ferruginous Duck is described as being somewhat shy, we observed that the birds appeared to be quite at ease in this place, although the level of disturbance was high, due to the proximity of the tank to the main arterial highway. The birds appeared to associate with other species (Cotton Pygmy Goose, Comb Duck, Northern Pintail, Gadwall, and Indian Spotbill Duck). This is interesting, in that though the birds are said to associate with other diving ducks, their association with dabbling ducks is not reported earlier.

Extant distribution records for the species are not very conclusive. The IUCN Red Data List indicates that there are some grounds for concern for this species, as it is listed as “Near Threatened”, with a population trend of “Decreasing”. The species has a justification of “There have been rapid declines in Europe, but evidence of declines in the larger Asian populations is sparse, and sometimes contradictory, so it is currently listed as Near Threatened. Evidence of rapid declines in Asia would qualify the species for up listing to Vulnerable” (BirdLife International 2016). Ali and Ripley (1989) mention the distribution of this species as “Breeds in Kashmir and Ladakh; winter visitor elsewhere. Common in

W. Pakistan and N. India, and practically the entire Union; Nepal (valley chiefly on passage; bhabar winter). Less common to rare in Bengal, Assam, Manipur, E. Pakistan. Sparsely in the Deccan south to Mysore and Kerala (on coastal backwaters and lagoons). No record from eastern side of the Peninsula south of Madras or Ceylon.”

In “Spotlight – White-eyed Pochard”, published in *Pitta*, November 2000, Taher writes “A winter visitor (October to March) to India, though widely distributed and abundant in Pakistan and western India. Less common in eastern India, Bengal, Assam, Manipur, and Bangladesh, it is scarce in the Deccan and South India (Karnataka, Maharashtra, and Andhra Pradesh). No reports from Tamil Nadu or Sri Lanka, though there are two specimens from the erstwhile Madras State in the Madras Government Museum, Chennai. There are two old published records from Andhra Pradesh – one from Visakhapatnam District (1904) and the other from Nalgonda District (1935).”

We looked closely at records for the species from the state of Andhra Pradesh (AP) and now AP and Telangana, and found a few records of the species. Abdulali has written about this species from Hyderabad in *JBNHS* (Abdulali 1936); Srinivasulu has recorded it from the Adilabad district (Srinivasulu 2004). Baker and Inglis (1930) mention it as being quite rare along the Madras and Malabar coasts, and this is consistent with most extant literature, which shows the species as not having been reported from so far south. Sight records exist for Warangal district (Madannapet Cheruvu in 1994 and Nirkula Cheruvu in 2001). There is also a sight record from Nalgonda district from Musi Reservoir in 1993 (Pittie and Taher 2004).

Closer to Hyderabad, members of BSAP have sight records of this species from many places around the city.

Records exist for the ICRISAT campus in Patancheru (Hash and Peacock 1996; Hash *et al.* 1996). There are also records from Sangareddy Tank and the Manjira Reservoir. There is a record from the Bibinagar Tank from 1983 and one from Jogipet from 2004 (eBird). So the bird is not completely unknown in the Hyderabad region, at least, and there are published records of the sightings.

During the Hyderabad State Ornithological Survey (Ali 1933), this species was not sighted by the survey team. The survey period as mentioned in Dr Sálím Ali’s report is from October 03 to December 20, 1931, and from February 28 to end April 1932. This being the case, it is possible that so secretive a bird may well have been overlooked, especially since the peak migration season was not part of the covered period.

In the Vernay Scientific Survey of the Eastern Ghats, this species only has a single mention “There is no definite record of the White-eyed Pochard in the Presidency beyond Hume’s general statement (GAME BIRDS, iii, 263) that it occurs in the Northern Circars and that he has no record from south of Madras.” (Whistler and Kinnear 1937).

Going by the above historical records and references, it seems quite probable that the Ferruginous Duck, though not unknown from our region, remains a rarely seen and unusual visitor to the state. Old records notwithstanding, it is clear that there is insufficient data available from recent times, to make even a reasonable estimate of current probable wintering populations in either Andhra Pradesh or Telangana States. Also given its current status of ‘Near-Threatened/Declining’ in the IUCN Red Data Lists, it is perhaps a good time to make a plea to all naturalists and birdwatchers to keep an eye open for these birds and to report any sightings that may be made. Historical sightings would be equally as interesting to us as any current sightings.

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8. SIGHTING OF JERDON'S BAZA *AVICEDA JERDONI* (BLYTH, 1842) FROM GREAT NICOBAR ISLAND, ANDAMAN & NICOBAR ARCHIPELAGO, INDIA

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Jerdon's Baza *Aviceda jerdoni* belongs to the family Accipitridae under order Accipitriformes and is distributed in India, Sri Lanka, Myanmar, Malaysia, southern China, Thailand, Indonesia, and Philippines. The species has been listed as Least Concern in the IUCN Red List (BirdLife International 2015).

Jerdon's Baza is a medium-sized raptor measuring 40–50 cm long and can be mistaken for Crested Goshawk or Crested Hawk-eagle in flight. However, it can be distinguished by the longer upright crest, very broad and rounded paddle-shaped wings, and normally plain and pale underparts (Rasmussen and Anderton 2005). Jerdon's Baza is mostly found in the evergreen forests and tea estates of Southeast Asia (Rasmussen and Anderton 2005). It is resident in the Terai of northern India and foothills of the Eastern Himalaya from eastern Nepal and Bengal duars to the Assam valley, Western Ghats in southern India, southern Sri Lanka, Bangladesh, Burma (now Myanmar), Thailand (Ali and Ripley 1983), Sumatra (Buij 2003), Singapore (Chan *et al.* 2007), and Philippines (del Hoyo *et al.* 1994). Two subspecies (*jerdoni* and *ceylonensis*) are reported from India (Ali and Ripley 1987; Grimmett *et al.* 2011). The species *jerdoni* is known from the tropical evergreen and moist deciduous forests of Sikkim, eastward to Myanmar, while *ceylonensis* occurs in the tropical and subtropical evergreen and moist deciduous forests of Western Ghats, Eastern Ghats, and Sri Lanka. Very few sight records of Jerdon's Baza are reported from different localities of India, namely Kerala (Vishnudas 2007); Dakshina Kannada, Karnataka (Achar and Nayak 2000), Andhra Pradesh (Srinivasan *et al.* 2012),

and Tripura (Deuti 2013).

The Great Nicobar Island is the southernmost island of the Andaman & Nicobar archipelago. It lies between 6° 45' to 7° 15' N and 93° 38' to 93° 55' E. Great Nicobar Island includes the Great Nicobar Biosphere Reserve, Campbell Bay National Park, Galathea National Park, Galathea Bay Wildlife Sanctuary, and Megapode Island Wildlife Sanctuary. The total geographical area of this island is approximately 1,044.54 sq. km, of which the Biosphere Reserve covers 1,038.70 sq. km. The island represents a unique and threatened tropical evergreen forest ecosystem, including a host of forest systems, ranging from seasonal rainforests in the low hills, tropical mountain forests, and moist deciduous to dry deciduous types. Great Nicobar Island is located about 482 km south of Port Blair, the capital of the archipelago. The length of this island is 55 km from Murray Point in the north to Indira Point in the south. This island has a rich heritage of faunal diversity and the area also harbours one of the most endangered and endemic bird species, the Nicobar Megapode *Megapodius nicobariensis*.

On February 14, 2016, the second author (GG) sighted a single Jerdon's Baza in the forest edge at Shastri Nagar (06° 48.541' N; 93° 53.165' E) in Great Nicobar Island. Later, on March 25, 2016, it was sighted again and photographed at Jogindar Nagar (06° 57.751' N; 93° 55.434' E). The bird was identified based on the prominent white-tipped black crest, mesial stripe, and distinct banding pattern on the ventral side while in flight. The present sighting of Jerdon's Baza is a new distribution record to Andaman & Nicobar Islands.

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9. RECOVERIES OF RINGED SAND PLOVERS INDICATE THE IMPORTANCE OF MODHAVA, GUJARAT, AS A STOPOVER SITE FOR MIGRANT WADERS FROM EAST AFRICA

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The closely related Lesser Sand Plover *Charadrius mongolus* and Greater Sand Plover *C. leschenaultii* are both medium-sized, long-distance migrants that breed across Central Asia and spend the non-breeding season from East Africa through the Middle East, around the shores of southern Asia, and throughout Southeast Asia and Australasia (Balachandran 1998; Cramp *et al.* 1983; Hirschfield *et al.* 2000). While both can be very common, occurring in large flocks on passage and in their non-breeding grounds, little is yet known about the relationship between the different breeding populations and subspecies, their migration routes, and their non-breeding grounds (Delany *et al.* 2009; Hirschfield *et al.* 2000; Wiersma *et al.* 2016a).

Five races of *Charadrius mongolus* are recognized: three form the more westerly breeding 'atrifrons group' which includes *C. m. pamirensis* centred on the Pamir mountains, *C. m. atrifrons* in Tibet, and *C. m. schaeferi* in north-central China south to eastern Tibet. The remaining two form the easterly-breeding 'mongolus group' containing *C. m. mongolus* east and north of Lake Baikal in Siberia and *C. m. stegmanni* farther east and north into Chukotka (Cramp *et al.* 1983; Hirschfield *et al.* 2000).

Three races of *Charadrius leschenaultii* are recognized: *C. l. columbinus* is the smaller-billed, most westerly race, *C. l. scythicus* has the generally longest wing-length and is found in western Central Asia, and *C. l. leschenaultii* occurs farthest east across Mongolia and extending slightly farther north than *scythicus* into southern Siberia (Cramp *et al.* 1983; Delany *et al.* 2009; Wiersma *et al.* 2016a).

All races of both species are migratory, flying south from the breeding grounds to spend the boreal winter along the coastlines of East Africa, south and east Asia, and Australia (del Hoyo *et al.* 1996; Hirschfield *et al.* 2000; Nielsen 1971; Summers *et al.* 1987). Detailed analysis of museum skins has allowed an overall understanding of which race migrates to which general non-breeding ground

and shown that for example perhaps surprisingly and unlike previously thought, the race of Greater Sand Plover found on the East African coastline was the nominate *leschenaultii* that breeds the furthest east in Mongolia and not the Central Asian *scythicus* (Delany *et al.* 2009; Hirschfield *et al.* 2000).

In recent years, much has been discovered about the migration route and breeding grounds of both these species following the East Asian/Australasian Flyway, in particular about Greater Sand Plovers, due to substantial effort put into ringing and observing birds at key sites along the flyway (Minton 2005; Minton *et al.* 2013). However, next to nothing has been learnt regarding the routes and migration timing of birds following the Central Asia/South Asia and West Asia/East African Flyways (Wiersma *et al.* 2016b).

The photograph, therefore, of a Greater Sand Plover on Modhava beach near Mandvi-Kutch, Gujarat on April 10, 2015 taken by Mr. Prashant Tewari (Fig. 1) that had been ringed and flagged on the Kenyan coast was noteworthy. The plover, ring no. A70821 and orange colour flag no. 'TA' had originally been ringed at Mida Creek, Kenya on November 08, 2004, as an adult. It had then been retrapped at the same location on September 16, 2013, before being photographed on Modhava beach in 2015. This was the first Greater Sand Plover to be recovered from any ringing carried out in East Africa and it showed that the north-western coastline of India was probably a staging post for this species on its way to its breeding grounds in Mongolia.

Remarkably, a year later on March 29, 2016, the same bird 'TA' was seen and photographed by Mr Jaysukh Parekh 'Suman' and his son Nirav Parekh at the same location as in 2015, Modhava beach (Fig. 2). Even more remarkably, another year later on March 30, 2017, the very same Greater Sand Plover with leg flag 'TA' was photographed yet again by the same photographers on the same Modhava beach (Fig. 3). This confirmed the suggestion that Greater Sand



Fig. 1: Tagged Greater Sand Plover, 'TA', photographed at Modhava Beach, Mandvi, April 10, 2015



Fig. 3: Tagged Greater Sand Plover, 'TA', photographed at Modhava Beach, Mandvi, March 30, 2017



Fig. 2: Tagged Greater Sand Plover, 'TA', photographed at Modhava Beach, Mandvi, March 29, 2016



Fig. 4: Tagged Lesser Sand Plover, 'S6', photographed at Modhava Beach, Mandvi, May 22, 2016

Plovers from East Africa migrate through north-western India, using the beaches around Mandvi as an important staging site to gain strength and accumulate fat for the final flight overland to breeding grounds up to 4,000 km to the north-east.

In a further remarkable event almost two months after first photographing the Greater Sand Plover 'TA', Mr Parekh found and photographed on May 22, 2016 a second flagged bird, this time a Lesser Sand Plover, ring no. F00338 and white colour flag no. 'S6' (Fig. 4). It had been ringed at the same location at Mida Creek, Kenya, on January 20, 2013, by A Rocha Kenya. This is the second recovery of a Lesser Sand Plover from East Africa, the first being ringed also at Mida in December 1982 and recovered in September 1985 on the Pakistan coast, 650 km west of Mandvi. Even more extraordinarily, Mr Parekh photographed this same Lesser Sand Plover again, flag no. 'S6', on the same beach but another year later on May 24, 2017 (Fig. 5).

Together these demonstrate the importance of the north-western India and Pakistan coastline as a staging



Fig. 5: Tagged Lesser Sand Plover, ‘S6’, photographed at Modhava Beach, Mandvi, May 24, 2017

and fattening area for Lesser and Greater Sand Plovers that spend the non-breeding season on the north Kenyan coast. They also confirm the high level of site fidelity of the birds which prefer to use the same location for both stopping over

to fatten as well as to spend the non-breeding season. Around 300 Greater Sand Plovers and the same number of Lesser Sand Plovers have been ringed and marked with leg flags by A Rocha Kenya at Mida Creek – orange flags for Greater Sand Plovers and white for Lesser Sand Plovers. Furthermore, similar numbers of Terek Sandpipers have been flagged with white leg flags at the same location. The advent of digital photography has greatly opened up the potential to record re-sightings of flagged or colour-ringed birds and to thus substantially add to our knowledge and understanding of their migration and overall biology (Minton *et al.* 2011). Through a better understanding in this way, we can better manage their habitats and hopefully help to conserve them more effectively. We strongly encourage birders with cameras to watch out for colour-marked birds and to photograph and report them to the Bombay Natural History Society.

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Details of recovered birds:

Lesser Sand Plover <i>Charadrius mongolus</i>			
Ring No.	Date of ringed / recovered	Location ringed / recovered	Migration distance / duration (years/months/days)
A43250	12.12.1982	Mida Creek, Kenya 03° 22' S, 39° 58' E	4,065 km; 2 y, 8 m, 22 d
	3.9.1985	Shadi Kor, Pasni, Baluchistan, Pakistan 25° 13' N, 63° 30' E	
F00338	20.1.2013	Mida Creek, Kenya, 03° 22' S, 39° 58' E	4,318 km; 3 y, 4 m, 1 d
	22.5.2016	Modhava, Mandvi, Gujarat, India 22° 46' N, 69° 26' E	
	24.5.2017	Modhava, Mandvi, Gujarat, India 22° 46' N, 69° 26' E	4,318 km; 4 y, 4 m, 3 d
Greater Sand Plover <i>Charadrius leschenaultii</i>			
A42779	7.9.1981	Suakin, Red Sea coast, Sudan 19° 08' N, 37° 17' E	1,838 km; 0 y, 6 m, 25 d
	3.4.1982	Habara, Syria 35° 40' N, 37° 45' E	
A70821	8.11.2004	Mida Creek, Kenya 03° 22' S, 39° 58' E	0 km; 8 y, 10 m, 10 d
	16.9.2013	Mida Creek, Kenya 03° 22' S, 39° 58' E	
A70821	10.4.2015	Modhava, Mandvi, Gujarat, India 22° 46' N, 69° 26' E	4,318 km; 10 y, 5 m, 3 d
A70821	29.3.2016	Modhava, Mandvi, Gujarat, India 22° 46' N, 69° 26' E	4,318 km; 11 y, 4 m, 22 d
	30.3.2017	Modhava, Mandvi, Gujarat, India 22° 46' N, 69° 26' E	4,318 km; 12 y, 4 m, 23 d

Note: y = years, m = months, d = days

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10. *HASORA CHROMUS* (HESPERIIDAE, LEPIDOPTERA): A NEW RECORD FOR DELHI, INDIA

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The Common Banded Awl *Hasora chromus* Cramer 1780, earlier *Hasora alexis* Fabricius 1775, is a member of family HesperIIDae and is known to occur in India, Pakistan, Nepal, Bhutan, Bangladesh, Myanmar, and Sri Lanka (Kehimkar 2008). The species is more frequently found in India and it is among the most widely distributed species in the subfamily HesperIIDae, order Lepidoptera (Kehimkar 2008; Wynter-Blyth 1957). Previous studies on butterflies did not show any record of *H. chromus* from Delhi (Ashton 1973; Donahue 1967; Jandu 1942, 1943; Larsen 2002). *H. chromus* is easily identifiable and the likelihood of mistaking it for other closely related species is not likely.

On December 09, 2014 at 11:35 hours, I photographed *H. chromus* nectaring on *Lantana camara* near Flagstaff Tower, Kamala Nehru Ridge, North Delhi. It was a bright, sunny day with very little wind blowing. The temperature and relative humidity recorded using pocket weather meter were 24.5 °C and 43% respectively. The butterfly nectared on *Lantana camara* for almost a minute and then flew away.

The adults are fast flying and the wingspan is roughly 45 mm. Adults usually perch on the underside of the leaf. The species closely resembles a few other members of the genus to which it belongs. However, it could be identified by:

- (1) ♂: UPF unmarked, dark brown in colour.
- (2) ♀: In space 2 and 3 of discal band, large yellowish white spots, suggesting it was a female.
- (3) UN brown with purple sheen.
- (4) UNH with bluish white band diffused towards outside. A black tornal patch was seen (Kehimkar 2008; Wynter-Blyth 1957).

Among the known host plants of *H. chromus*, *Ricinus communis* and *Pongamia pinnata* are present in Kamala Nehru Ridge, where the species was spotted. *H. chromus* is already documented from states adjacent to Delhi such as Punjab and Uttarakhand (Kumar 2015; Smetacek 2012). It is possible that *H. chromus* might have reached Delhi from these states while migrating or was transported accidentally.

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11. *TURNERA SUBULATA* SM. (FAMILY PASSIFLORACEAE): A NEW HOST OF TAWNY COSTER *ACRAEA VIOLAE* LINN. IN KERALA, INDIA

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Tawny Coster *Acraea violae* Linnaeus, 1758 is native to peninsular India and Sri Lanka (Bingham 1905; Doubleday and Westwood 1846–1850; Kunte 2000). Tawny Coster larvae are polyphagous and have been reported to feed on leaves of more than 10 families of plants in India (Khot and Gaikwad 2011). New host plants are occasionally added to the list of Tawny Coster larval diet. Larval defoliation of *Turnera ulmifolia* was recently reported (Khot and Gaikwad 2011). The authors report *Turnera subulata* family Passifloraceae as a new host species of Tawny Coster larvae. In a recent publication, *Turnera ulmifolia* was misidentified as *Turnera subulata* to report the latter as a new larval host of *Acraea violae* (Gideon *et al.* 2016).

Florivoral behaviour of Tawny Coster larvae was initially observed on *Turnera subulata* (Fig. 1) within Technopark campus, Trivandrum, Kerala, India, in June 2016. Subsequently, it was extensively observed at other locations within Trivandrum and Kollam, Kerala, India. *T. subulata* is an invasive angiosperm native to Tropical America (Reddy 2008). The species has been reported to be widely naturalized outside its native range (Short 2011).

To observe the life history, 54 larvae were reared in the laboratory. The first three instars were folivorous and confined to the lower surface of leaves. Mature larvae (4–5th instars)



Fig.1: Larvae feeding on flowers of *Turnera subulata*

were florivorous, feeding voraciously on unopened buds and flowers. The presence of large numbers of Tawny Coster larvae on *T. subulata* implies its potential as a host plant. Larval feeding on flowers causes considerable damage to the host plant, resulting in reduction of seed set and further multiplication. Hence, Tawny Coster larvae can be considered as a potential biological control agent against the invasive *Turnera subulata*.

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12. FIRST REPORT OF *EUPLOEA KLUGII* FROM UTTAR PRADESH, INDIA

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Euploea klugii (Moore 1858) is a widespread species that has been recorded from Sri Lanka and southern India through Nepal to Malaysia. It inhabits dense forests in regions of heavy rainfall and belongs to a group of distasteful butterflies that contain cardinolides (toxic glycosides) in their body tissues. They are often very common in suitable localities and are known to migrate in large numbers in southern India and North America.

A peculiar feature of this group of butterflies is the need for males to obtain pyrrolizidine alkaloids to trigger their courtship. Therefore, males often congregate on flowers or roots of certain plants having these alkaloids.

While conducting a survey of butterflies in Katarniaghat Wildlife Sanctuary (27° 55'–28° 25' N; 81°–81° 25' E), Uttar Pradesh, some Crows along with other Danaiid and Plain Tiger butterflies were seen sitting on Coat Button plant *Tridax procumbens* and on milkweed, and photographed (Eds: photographic evidence provided). While identifying the specimens photographed during the survey at the Butterfly Research Centre, Bhimtal, it was noted that one of the individuals was *Euploea klugii*.

Perusal of the literature indicates that *Euploea klugii*

has been previously reported as far west as the Kathmandu valley in Nepal (Smith 2006) and northern Bihar in India (Varshney and Smetacek 2015). Two subspecies occur in India, *E. klugii kollari* C. & R. Felder (1865) from Gujarat eastwards to West Bengal and Odisha, and *E. k. klugii* Moore from northern Bihar, Sikkim to NE India. Both forms occur together in N.E. India and Nepal (Smith 2006).

Conclusion

The current record extends the known distribution of the species *Euploea klugii* considerably westwards from northern Bihar to Katarniaghat Wildlife Sanctuary.

Since this species is known to migrate in southern India, the possibility that the presently recorded butterfly was a migrant from further south or east cannot be ruled out, but it is generally believed that migrating butterflies do not prime their pheromones from alkaloid sources which the individual photographed appears to be doing. Therefore, the status of the species in Katarniaghat needs to be established, whether it is a vagrant, a regular migrant, a part time colonizer like *Delias acalis* (Godart 1819) in the Western Himalaya, or a resident that has been overlooked among swarms of *Euploea core* (Cramer 1780).

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13. PURPLE AND GOLD FLITTER *ZOGRAPHETUS SATWA* (DE NICÉVILLE, 1884), FAMILY HESPERIIDAE, A NEW RECORD FOR BANGLADESH

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Members of the genus *Zographetus* Watson, 1893 are known to be distributed in southern Asia. Ten species are recorded under genus *Zographetus* (Savela 2016). Their distribution records are as follows:

- (i) *Zographetus satwa* (de Nicéville, 1884), India (Sikkim, Assam, Uttarakhand), Myanmar, Thailand, Laos, China (Hainan), Langkawi, Malaysia, Java (Fan *et al.* 2007; Inayoshi 2016; Varshney and Smetacek 2015);
- (ii) *Z. pangi* Fan & Wang, 2007, China (Guangdong, Ruyuan) (Fan *et al.* 2007);
- (iii) *Z. doxus* Eliot, 1959, Myanmar, Thailand, Malaysia, Singapore, Borneo (Corbet and Pendlebury 1992);
- (iv) *Z. hainanensis* Fan & Wang, 2007, China (Fan *et al.* 2007);
- (v) *Z. kutu* Eliot, 1959, Malaysia (Corbet and Pendlebury 1992);
- (vi) *Z. ogygia* (Hewitson, 1866), India (Sikkim, Western Ghats: Goa southwards), Malaya, Thailand, Laos, Borneo, Sumatra, Nias, Banka, Java (Kehimkar 2016; Lewis 1973; Varshney and Smetacek 2015);
- (vii) *Z. ogygioides* Elwes & Edwards, 1897, Thailand, Malaysia, Borneo, Sumatra (Savela 2016);
- (viii) *Z. pallens* de Jong & Treadaway, 1993, Philippines (Savela 2016);
- (ix) *Z. rama* (Mabille, 1877), India (Assam), Myanmar, Thailand, Laos, Malaysia, Langkawi, Singapore,

Sumatra, Philippines, Celebes (Inayoshi 2016; Varshney and Smetacek 2015);

- (x) *Z. abima* (Hewitson, 1877), Celebes (Lewis 1973).

There is no previous record of the genus *Zographetus* or species *Z. satwa* from Bangladesh (Larsen 2004). During the survey period in December 2016, we recorded *Zographetus satwa* as a new record from Madhabkunda Eco Park, Bangladesh, which is presented in this note.

One individual was recorded in the Madhabkunda Eco Park, Moulvi Bazar (24° 38' 16.72" N; 92° 13' 21.21" E) (27.xii.2016; Local time: 12:30 pm (BST); Height of *Z. satwa* active zone from ground: 10 m). During the observation, we continuously monitored the habitat and movement of butterflies. The individual came from top of the Patharia hill near Madhabkunda waterfall and sat on a leaf of a Wild Banana tree. Immediately after alighting, it opened its wings and sat basking for three minutes, after which it changed place and sat on another leaf for five minutes. At last it flew to a bush of *Chromolaena odorata* and started feeding on nectar from the flowers.

The sighting spot was an inaccessible place beside a hill near a running stream and was covered with heavy bushes of *Chromolaena odorata* and Banana *Musa* sp. trees. We could only photograph the species using a 250 mm telephoto lens, and were unable to collect the specimen for identification or preservation. The photograph was identified with the help of

the description and diagrams of HesperIIDae given by Watson (1893), Evans (1927), Fan *et al.* (2007) and IFB (2017) (<http://www.ifoundbutterflies.org/sp/839/Zographetusatwa>) respectively.

The characteristics which matched the photographed species without any ambiguities about the identification are as follows:

Antennae clubbed and elongate, with a short apical crook, tip acuminate. Palpi: third joint minute, obtusely conical. Fore wing: apically rather produced; inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars

suberect, the middle one slightly longer than the lower; vein 5 slightly nearer to 4 than to 6; vein 3 shortly before end of cell; Cilia greyish.

Hind wing: underside with basal half yellow, distal half brown making it different from other congenics. Outer margin slightly excavated at vein 2; vein 7 well before the end of cell, arising at an acute angle; vein 3 immediately before end of cell; vein 2 very close to vein 3, more than twice as far from base of wing as from end of cell; lower margin of cell slightly angled at vein 2. Hind tibiae with two pairs of spurs.

The larval host plant and other behaviour of this species are still unknown in Bangladesh.

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14. A NEW HOST PLANT OF RED PIERROT *TALICADA NYSEUS* GUERIN, 1843 RECORDED IN MUMBAI, MAHARASHTRA, INDIA

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The Red Pierrot *Talica da nyseus*, a member of the family Lycaenidae (commonly known as Blues), is a small butterfly found in the Indian subcontinent and Southeast Asia. The larvae of the Red Pierrot have been reported to feed on *Kalanchoe laciniata* and *K. pinnata* of the family Crassulaceae. Adult butterflies have been known to visit lichens sometimes. Studies suggest that they collect phenolic substances by scraping lichens (Karunaratne *et al.* 2002, 2008; Kehimkar 2008; Wynter-Blyth 1957).

Recently, a Red Pierrot was observed laying eggs on a new host plant which was planted beside *Kalanchoe pinnata*. The new host plant was identified as *Kalanchoe serrata* (Fig. 1), commonly known as Kalanchoe Magic Tower. This was on the 20th floor of a high rise apartment in Mumbai Central. According to past records, the Red Pierrot is a weak flier

and flutters close to the ground. But this tiny butterfly was observed in a balcony on the 20th floor. The female laid four eggs on the new host plant *Kalanchoe serrata* and more than 20 eggs on *Kalanchoe pinnata* on March 07, 2017. On March 10, 2017, the eggs hatched and the caterpillars bored into the fleshy leaves of the new host plant (Figs 2 and 3). They moved on to new leaves after completely consuming the leaves. They left a blackish green trail within, filled with frass particles (droppings). The caterpillars, along with the new food plant, were reared in a box to record the life cycle. The first pupa was observed on March 26, 2017, and on the next day the other three caterpillars pupated. On March 30, the first pupa turned brownish black and appeared infected. On April 04 and 05, 2017, the other three pupae turned completely black. Two butterflies emerged on April 04, and the third pupa on April



Fig. 1: Egg on the plant

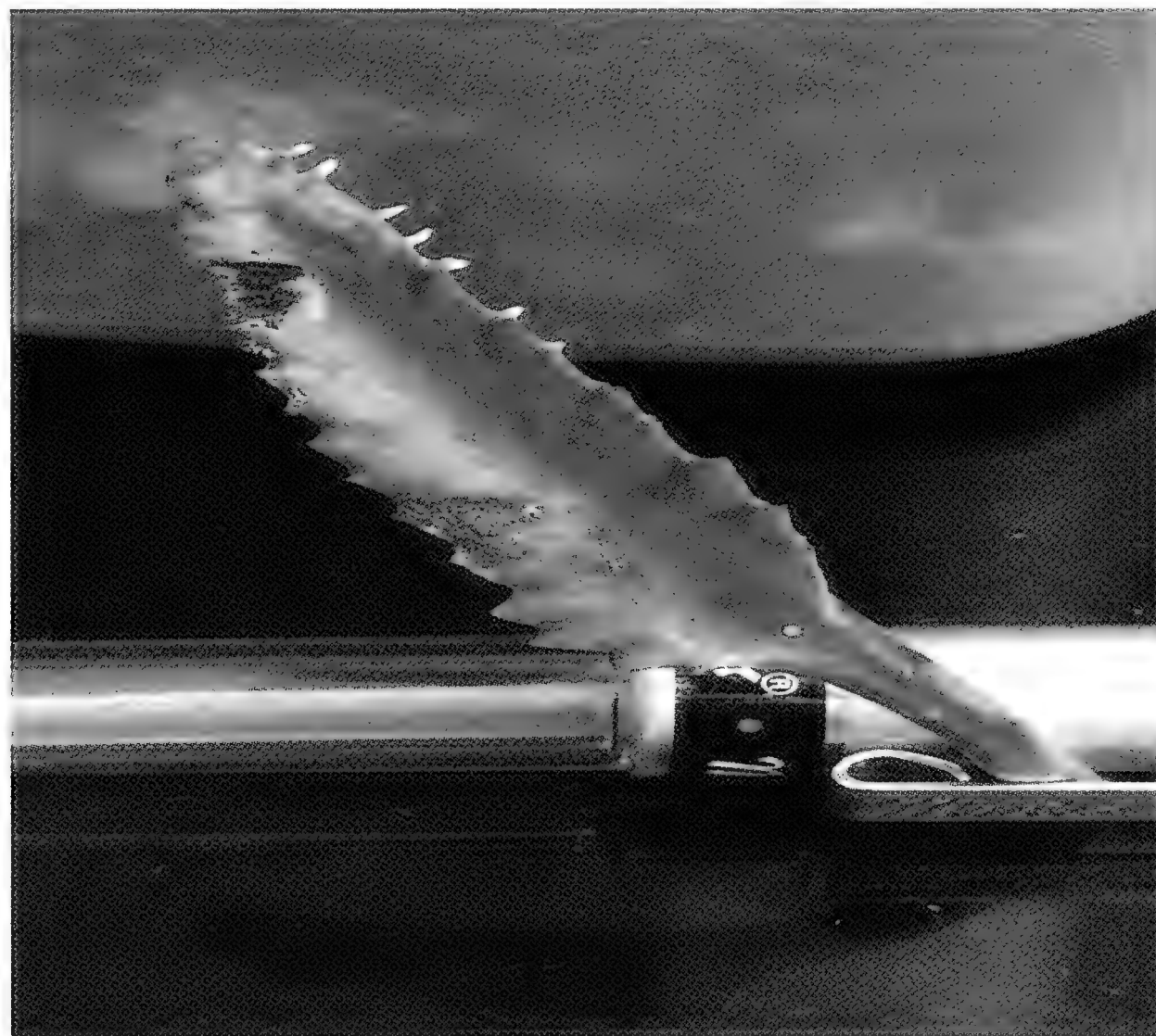


Fig. 2: Caterpillar leaf mining



Fig. 3: Caterpillar feeding from inside the leaf

Fig. 4: The host plant *Kalanchoe serrata*

05. The lifecycle of the Red Pierrot butterfly feeding on the new host plant was thus completed in 29–30 days.

Description of *Kalanchoe serrata* Mannoni and Boiteau, 1947

The host plant *Kalanchoe serrata* is native to central and southern Madagascar. It has succulent, thickened, narrow, ovate, grey-brown leaves, with their undersides marked with a darker chocolate brown; they produce plantlets along the serrated leaf margins (Fig. 4). The plantlets fall off the leaves to readily root and grow in the substrate. Though grown in pots and rock gardens in India, *Kalanchoe serrata* is known to be invasive in some countries. It could be easily

confused with *Kalanchoe daigremontiana* and *Kalanchoe x houghtonii* (Mother of Millions hybrid), as the shape of the leaves and the stripe marks are very similar. However, the edges of the leaves of *K. serrata* are more tooth-like than in *K. daigremontiana* (Knowledgebase Lookseek 2017; Plants Database 2017; The Plant List 2017; Top Tropicals 2017).

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15. NORTHERNMOST BREEDING RECORD OF ORCHID TIT *CHLIARIA OTHONA* (HEWITSON 1865) FROM THE WESTERN GHATS, AT SANJAY GANDHI NATIONAL PARK, THANE, INDIA

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Introduction

Chliaria othona (Hewitson 1865) is an uncommon butterfly belonging to Subfamily Theclinae under Family Lycaenidae. It has been recorded in the Western Ghats northwards up to Thane-Mumbai, and in northern India from Uttarakhand to Arunachal, northeast India, and the Andaman Islands. It prefers dense wet forests and can be seen on the wing up to 1,500 m in the Himalaya from February to November and from October to May in the Western Ghats.

This note provides the first documentation of its lifecycle stages and also its larval host plants in the Mumbai-Thane region. This is the northernmost distribution record in the Western Ghats as well. *Chliaria othona* was newly reported from Mumbai-Thane region between December 2014 and March 2015. The search for life cycle stages was carried out on the flower buds of commonly seen epiphytic orchids following persusal of literature (Wynter-Blyth 1957) in the same region. We found the eggs of this species at Yeoor forest range of Sanjay Gandhi National Park, Thane, and further life cycle was observed in natural environment. Each instar was observed and documented photographically, giving special attention to larval behaviour and morphological transitions.

Host plants: *Cottonia peduncularis* and *Acampe*

praemorsa (Family: Orchidaceae).

Egg-laying behaviour: The adult female lays eggs on flower buds (Swinhoe 1911–12), singly on each bud (pers. obs.) (Fig. 1a).

Eggs: Eggs white, shiny, hemispherical in shape like a half cut golf ball.

Hatching: Eggs hatch on the third or fourth day. The emerging first instar is approximately 1 mm in length (Fig. 1b).

First instar: Small, hairy yellowish caterpillar with reddish line passing through all the segments on dorsal side of body (Fig. 1c). Size reaches 3 mm.

Second instar: Second instar larger, with a prominent pink-red coloured line passing through all the segments on dorsal side of the body along with a pair of faint pink lines on the lateral sides (Fig. 1d and e). Hairs present on all the segments. Size 5–6 mm in length.

Third & fourth instars: The third instar is similar to the second instar, except that it grows in length as well as thickness (Fig. 1f and g). Size 9 mm in length. In fourth instar the striations on lateral side are fused to form a broad band similar to the one on dorsal side (Fig. 1h). Both bands are pinkish purple in colour. Hairs diminished. Size 1.1 cm in length.

Fifth instar: Colour turns greenish yellow, with

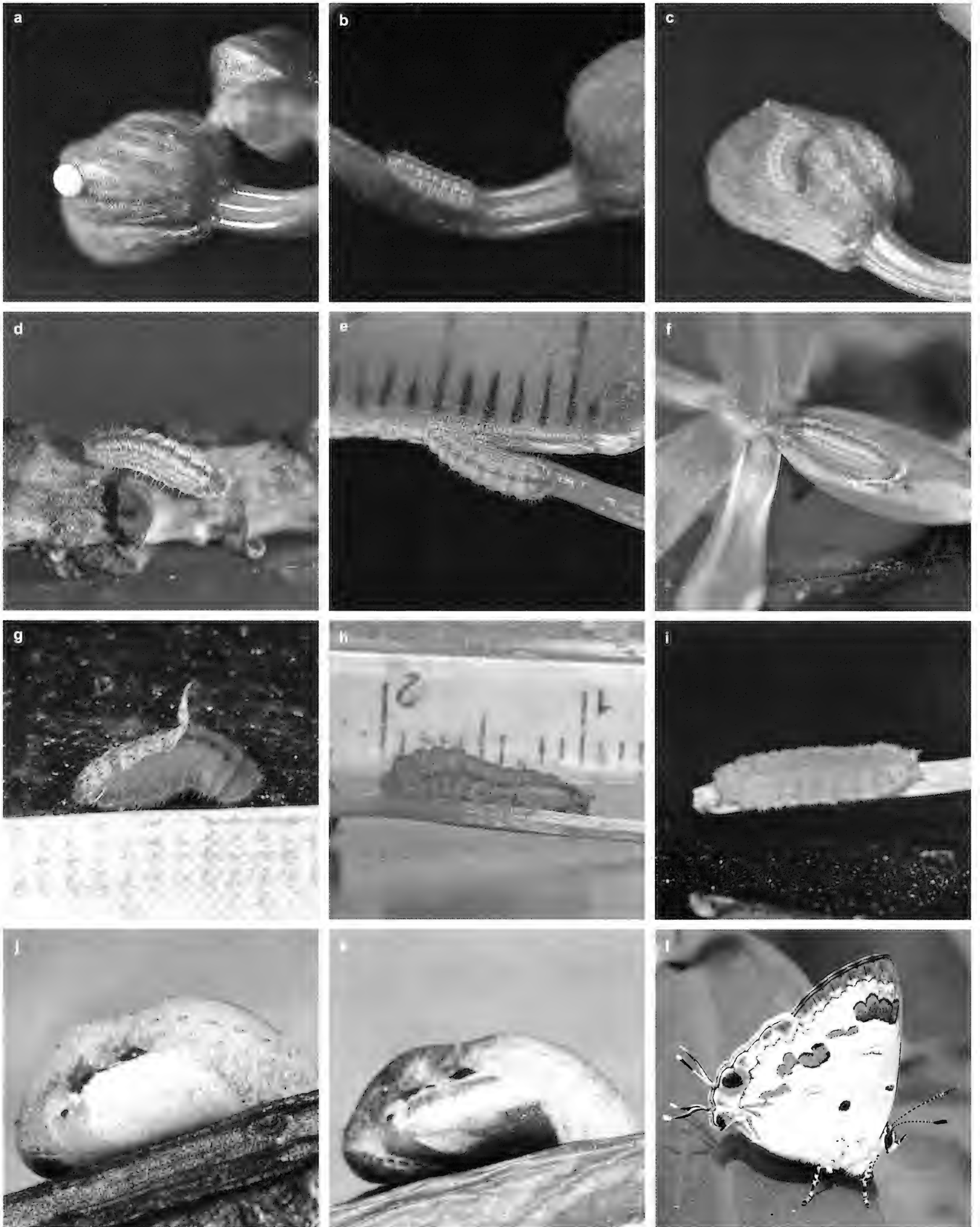


Fig. 1 (a-l) *Chliaria othona* (Hewitson 1865): a. Egg; b. & c. First instar larva; d & e. Second instar; f & g. Third instar; h. Fourth instar; i. Fifth instar; j & k. Pupa; l. Adult underside

diminished dorsal and lateral bands (Fig. 1i). Size reduced, indicating that it is preparing for pupation.

Larval behaviour: The first instar caterpillar fed only on the flower buds, making holes into them. From second instar onwards, it started feeding on the petals of flowers along with flower buds.

Pupa: Pupation occurs after 14–15 days of hatching. Initially the pupa was greenish in colour (Fig. 1j). On the second day it became greyish. It was stuck to the twig of larval host plant. The pupal stage continued for 9–10 days. Pupa appears similar in shape as that of other members of Subfamily Theclinae. A day before emergence, the wing area of the pupa becomes darker, nearly black (Fig. 1k), like the upperside wing colour, a few hours before emergence.

Adult: Hindwing with two delicate tails. Both sexes white on underwing with faint bars at end-cells, and black-edged brown markings (Fig. 1l). Discal band on UNF completely broken at vein 4, and upper part of band much wider than lower part. Prominent small black costal spot mid-cell. UNH discal band broken in spaces 4 and 6; prominent black spot in space 7 towards base (Evans, W.H. 1932). Tonal spots prominent and orange-crowned. Male pale blue on UP, with broad black apex and termen; the black apex is shot deep purple-blue. Narrowly black UPH apex and costa. Female brown on UP, with lower part of discal area whitish. UPH tonal area broadly bluish white, crossed by dark veins (Evans 1932; Kehimkar 2016)

Adult Behaviour: Both sexes were seen in open forest canopy with bright sunlight. This butterfly prefers to fly along forest trails, near ground level. Flight is strong and fluttering. Males were often seen visiting nearby mud-puddling areas and females were mostly seen near the larval hostplant.

Remarks

So far, in the Western Ghats, the life cycle of Orchid Tit *Chliaria othona* has been observed and documented in the form of photographic evidence of larval stages from Amboli in Sindhudurg district, Maharashtra state by Hemant Ogale. The documentation is available online on www.ifoundbutterflies.org website at <http://www.ifoundbutterflies.org/sp/509/Hypolycaena-othona>. Similar sightings of this species were reported in Kaas and Thoseghar, Satara district in Maharashtra by Milind Bhakare on March 03, 2011.

Further north from the above localities in Western Ghats, there is no published record in any source in the literature. Hence this note represents the northernmost record of observations on the lifecycle of this species from the Western Ghats.

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16. NEW RECORDS OF MARINE PARASITIC MOLLUSCS (MOLLUSCA: GASTROPODA) FROM ANDAMAN & NICOBAR ISLANDS, INDIA

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Introduction

Parasitism, a non-mutual symbiotic relationship between organisms, is one of the most common habits in the

marine ecosystem with parasitic molluscs being one such ecologically significant group. Marine gastropods belonging to the families Eulimidae, Pyramidellidae, Ovulidae,

Marginellidae, Epitoniidae, Cancellariidae, Triviidae, Architectonicidae, Colubrariidae, and Velutinidae are known to be ectoparasites or endoparasites of many slow-moving or sessile marine invertebrates, namely echinoderms, molluscs, annelids, coelenterates, ascidians, and sponges, and also fish (Lorenz 2005).

Studies on these parasitic gastropod families from Indian waters are lacking, which is evident from the fact that so far only 18 species of Eulimidae, 13 species of Ovulidae, and 19 species of Epitoniidae are reported from Indian waters (Subba Rao and La Fond n.d.; Tripathy and Mukhopadhyay 2015); whereas the Eulimidae family comprises about 4,000 species (Warén and Gittenberger 1993) including *c.* 1,500 parasitic species, while the families Ovulidae and Epitoniidae include *c.* 400 and 200 parasitic species respectively (Lorenz 2005) across the globe. Whereas eulimid gastropods are both ecto- and endoparasites on all classes of Echinodermata, the Ovulidae, a large family of egg-cowries, comprises obligate ectoparasites on gorgonians, alcyonarians, and antipatharians, spending their entire lives on their host coelenterates (Lorenz 2005). On the other hand, Epitoniidae or wentletraps as they are commonly known, are a very large family of heterogastropods that are permanent ectoparasites or foraging predators mostly associated with Actiniaria, and to some extent with Zoanthid or Scleractinian corals (Gittenberger and Gittenberger 2005).

Also, most of the studies on marine molluscs in India have only documented the distributional records of the species, while host association records are practically non-existent. The present work provides observations on host associations with brief species description of the parasitic gastropod molluscs, namely *Melanella bovicornu* and *Prosimnia semperi* recorded for the first time from Indian waters. Though *Epidendrium aureum* is being recorded for the first time from Indian waters of Andaman & Nicobar Islands, it had also recently been recorded from Lakshadweep Archipelago (Narayana and Apte 2016).

Methodology

Field surveys were carried out during February and March 2016 across Andaman Islands including Burmanallah, Port Blair (11° 34' 29.57" N; 92° 44' 21.06" E), and Rutland (11° 27' 41.61" N; 92° 40' 39.66" E). Specimens were collected by direct search method in the intertidal areas, under dead coral boulders and rocks during low tides and sub-tidal reefs, by SCUBA diving. The snails and their hosts were photographed in situ. Shell sculpture was observed under a binocular microscope and photographed with a digital camera. The specimens were stored in 90% ethyl alcohol after studying the morphological characteristics without relaxing them. To

study the shell sculpture of *Epidendrium aureum*, the shell was mounted on an aluminium stub, kept in the chamber, analysed in Low Vacuum mode (65 Pa) at a voltage of 20 kV and photographed using an environmental scanning electron microscope (SEM). Accession numbers were assigned to the specimens that were then deposited in the Bombay Natural History Society (BNHS) collections.

Results and Discussion

Systematics

Phylum: Mollusca

Class: Gastropoda

Subclass: Caenogastropoda

Order: Littorinimorpha

Superfamily: Vanikoroidea

Family: Eulimidae Philippi, 1853

Genus: *Melanella* Bowdich, 1822

***Melanella bovicornu* Pilsbry, 1905**

Syn: *Eulima bovicornu* Pilsbry, 1905.

Eulimids are identified by their tall glossy shell which is often slightly curved. Members of the genus *Melanella* are known to parasitize sea cucumbers as endoparasites or ectoparasites, feeding on the host's fluids through their proboscis (Queiroz *et al.* 2013; Will 2009). The present specimens were found to be associated with the sea cucumber *Holothuria hilla* (Lesson 1830). *Melanella bovicornu* is light green with yellow margin on the head region giving a greenish appearance to the shell (Figs 1a, b). The description provided by Pilsbry (1905) exactly matches the specimens found during the present study. Shell glossy white and moderately solid with 11–13 convex whorls, having single distinctly impressed varix (Fig. 1b); aperture ovate (Fig. 1c). Spire regularly tapering, attenuate near the apex and strongly bent to the right and backwards.

Habitat: Intertidal and sub-tidal region, loosely attached to the holothurian dermis as an ectoparasite.

Number of specimens: 1 (BNHS Gastro 1530).

Distribution: Japan, Philippines, French Polynesia.

Distribution in India: Burmanallah, South Andaman, Andaman and Nicobar Islands.

Remark: New record to India.

Superfamily: Cypraeoidea

Family: Ovulidae Fleming, 1828

Subfamily: Prionovolviniae Fehse, 2007

Genus: *Prosimnia* F.A. Schilder, 1925

***Prosimnia semperi* Weinkauff, 1881**

Syn: *Ovula hordacea* Lamarck, 1810 (unreviewed); *Ovula semperi* Weinkauff, 1881; *Ovula triticea* Fischer, 1927

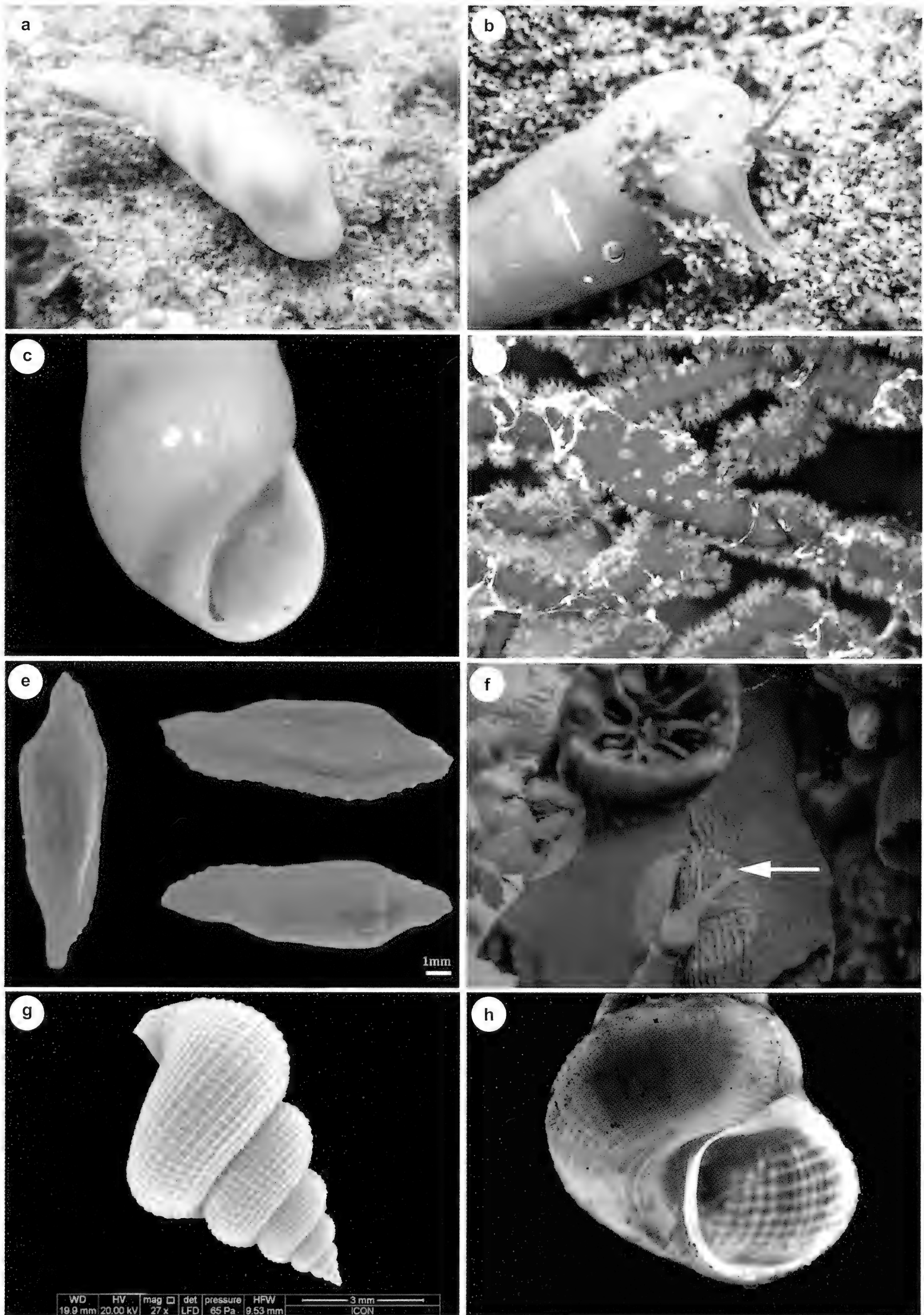


Fig. 1: (a): *Melanella bovicornu*, (b): Varices on the shell (arrow) of *Melanella bovicornu*, (c): Aperture of *Melanella bovicornu*, (d): *Prosimnia semperi* on gorgonian *Melithaea* sp., (e): Shell of *Prosimnia semperi*, (f): *Epidendrium aureum* with egg cases (highlighted) on dendrophylliid hosts *Tubastrea* sp. feeding on its mucus (arrow), (g): SEM photograph of *Epidendrium aureum* shell, (h): Aperture of *Epidendrium aureum*

(unreviewed); *Ovulum hordaceum* G.B. Sowerby I, 1830 (unreviewed); *Primovula coarctata* Schilder, 1941.

Prosimnia semperi is commonly known as Semper's Ovulid. It is known to show a preference for gorgonians from genera *Melithaea* and *Acabaria*. One specimen (BNHS Gastro 1764) of length 10 mm was observed on gorgonians belonging to the genus *Melithaea* at a depth of 11 m (Fig. 1d). The description of the collected specimens matches that of Lorenz and Fehse (2009); Draper and Churchill (2014) and is reproduced hereunder. Shell (Fig. 1e) red in colour, small, nearly cylindrical with tapering terminal collars; tips of terminals narrow and blunt. Dorsal surface granulose, ventral surface rough. Aperture narrow, widening abruptly at the fossular section. Labrum flattened, crenulated, and apertural edge denticulate. Outer labral shoulder coarsely undulate. Parietal lip crenulated.

Mantle red like that of the host, covered with fine dark maroon coloured rings and large white compound papillae that match the host polyps and calyces. Siphon red with a darker pattern of longitudinal lines.

Habitat: Ectoparasite on gorgonian of the genus *Melithaea* which is a conspicuously large, simple or bushy sea fan growing at depths of 2.0 to 45 m.

Number of specimens: 1 (BNHS Gastro 1764).

Distribution: Indonesia, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia, and Australia.

Distribution in India: Rutland, Pongibalu in South Andaman and North Reef Island in North Andaman, Andaman & Nicobar Islands.

Remark: New record to India.

Subclass: Caenogastropoda

Order: Unassigned

Superfamily: Epitonoidea

Family: Epitoniidae Berry, 1910

Genus: *Epidendrium* Gittenberger and Gittenberger, 2005

***Epidendrium aureum* Gittenberger and Gittenberger, 2005**

Three specimens along with egg cases were observed to be associated with *Tubastrea* sp. corals under rocks at a depth of 9 m (Fig. 1f). These shells were attached to the surface of their dendrophylliid hosts *Tubastrea* sp. with the help of mucus threads. The larger specimen (BNHS Gastro 1521) was used

to describe external morphology. Shell fragile, with convex whorls; 8.4 mm in length (Fig. 1g). Protoconch dark purplish red, which continues to the teleoconch whorls, gradually fading out and not visible from about the 6th teleoconch whorl onwards. Remaining parts of teleoconch white to yellowish. Protoconch with 3½ whorls; apart from its smooth apical part, it is sculptured with regularly spaced, very fine, incised, axial lines. Teleoconch with 6¾ whorls, separated by a moderately deep suture; sculptured with mostly regularly placed, discontinuous, orthocline, lamellar, slightly curved low costae, hardly touching the adjoining whorls. Aperture subcircular (Fig. 1h). Umbilicus moderately wide and operculum paucispiral (Gittenberger and Gittenberger 2005).

Habitat: The snails were found at 9 m depth, associated with *Tubastrea* sp. corals.

Number of specimens: 3 (BNHS Gastro 1521, 1522 (2 specimens in a vial)

Distribution: The species is known from the Indo-West Pacific, Red Sea, Seychelles, Maldives, Thailand, Japan, Philippines, Palau and Indonesia to Australia, India (Lakshadweep Islands).

New Distribution in India: Rutland, Pongibalu and Twin Islands, South Andaman, Andaman & Nicobar Islands.

Remark: New record for Andaman & Nicobar Islands which is the northernmost limit of the species in the Indian Ocean.

Conclusion

Parasitic molluscs exhibit unique adaptations and morphological specializations which have led to extensive adaptive radiation and great diversity, which in turn empowers co-evolution of host species. Further systematic studies of these parasitic marine gastropod families from India are required to fill the lacunae in our knowledge regarding these parasitic molluscs which can influence species throughout a community. The present findings add valuable information to the literature on Indian marine molluscs.

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17. SIGHTING THE SPIDER CRAB *ELAMENA XAVIERI* KEMP, 1917 (CRUSTACEA: DECAPODA: HYMENOSOMATIDAE) A CENTURY AFTER ITS FIRST REPORT ON THE INDIAN SEACOAST

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A Hymenosomatid crab *Elamena xavieri* is reported for the first time from Devi estuary of Odisha, on the east coast of India. The occurrence of this species is of interest, as despite a record of the same from Mandovi river, Goa, on the west coast of India, its presence in the waters of the Indian subcontinent, Bay of Bengal in particular, remained elusive for a century until the current study. Hence, the present communication is a step towards documentation of the species as a new record in the region, and a range extension.

Family Hymenosomatidae MacLeay, 1838, includes small “spider crabs” which prefer to live in shallow coastal waters of low salinity. The family includes 20 genera and 122 species of crabs worldwide (Davie *et al.* 2015). A peculiar feature of this family is the absence of megalopa larva during the early developmental stages. In these crabs, the 4 pairs of ambulatory legs are longer, spider-like and brittle, while abdominal segments and telson are markedly

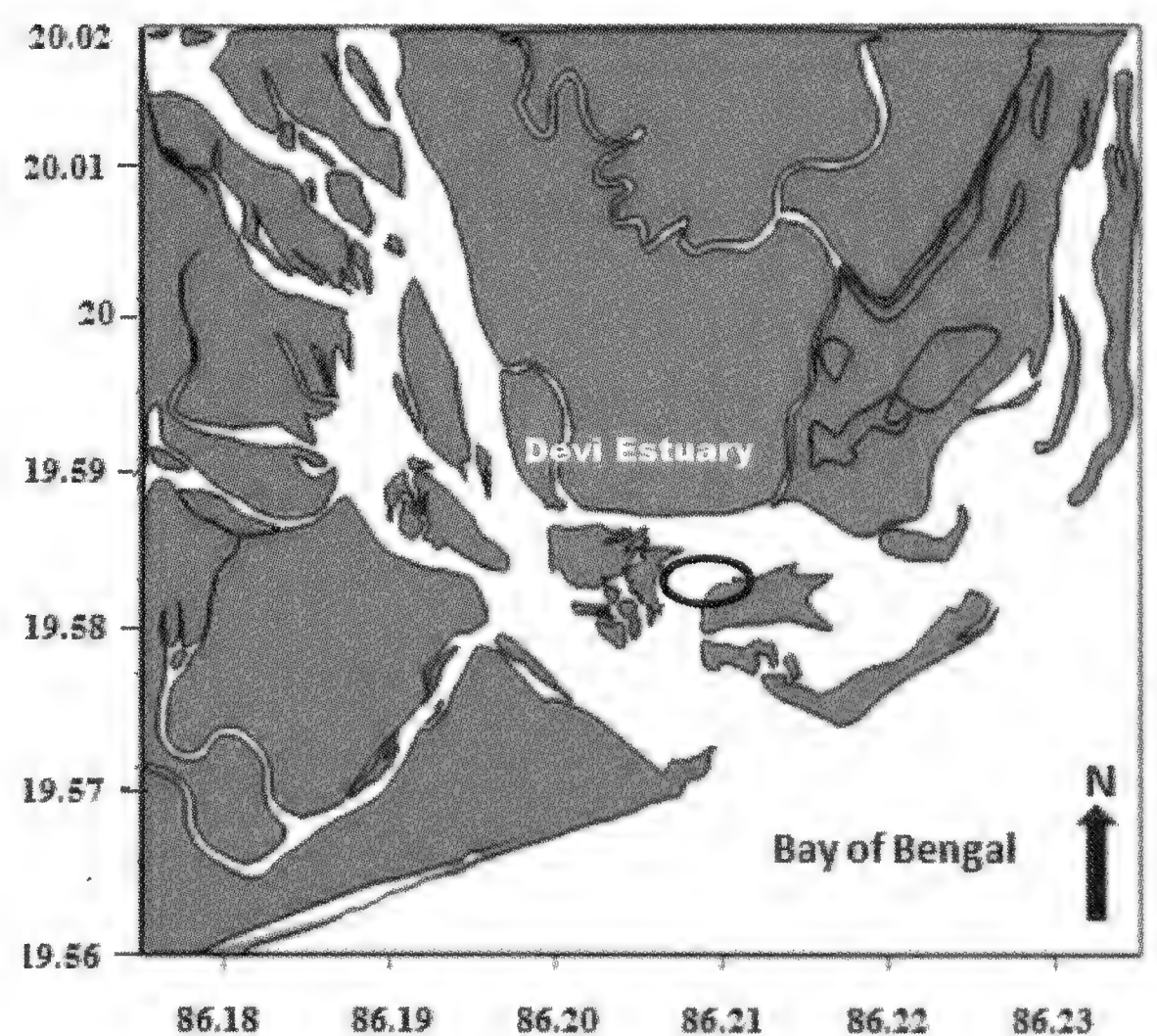


Fig.1: Location maps showing the Devi estuary, east coast of India. Exact site of observation is encircled

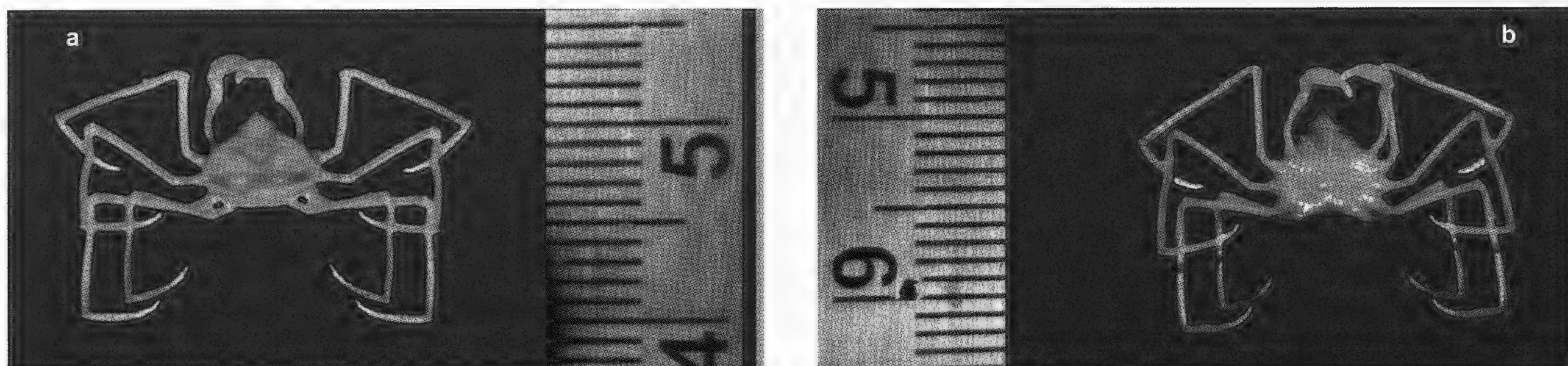


Fig. 2: *Elamena xavieri* Kemp, 1917 (a: Dorsal; b: Ventral)

unlike other brachyuran crabs (Dudgeon 1999; Lucas 1980) and are relatively larger. Members of the genus *Elamena* H. Milne Edwards, 1837 have a wafer thin, triangular or pear-shaped, moderately convex outline of the carapace with a characteristic triangular rostrum; grooves absent on upper surface of carapace. The external maxillipeds are broad and close the buccal cavern. Only five species have been reported from India, namely *Elamena truncata* (Stimpson, 1858), *E. sindensis* Alcock, 1900, *E. cimex* Kemp, 1915, *E. xavieri* Kemp, 1917, and *E. gracilis* (Borradaile, 1903).

The specimen reported here was obtained from dredge hauls in Devi estuary (19° 58' 30" N; 86° 21' 54" E) (February 2015) on the east coast of India, Odisha (Fig. 1), identified from taxonomic literature (Kemp 1917), and measured to the nearest 0.1 mm using Vernier callipers. It was preserved in 10% neutralized formaldehyde and deposited in the Environmental Science Laboratory Museum, Department of Zoology, Ravenshaw University, Cuttack, Odisha, and the Zoological Survey of India, Kolkata, India.

Systematic position

Elamena xavieri Kemp, 1917

Order Decapoda (Latreille, 1806)

Family Hymenosomatidae MacLeay, 1838

Genus *Elamena* (H. Milne Edwards, 1837)

Type species: *Hymenosoma mathoei* Desmarest, 1823

Diagnosis:

Elamena xavieri Kemp, 1917 (Figs 2, 3, and 4)

Carapace dark brown, pear-shaped in outline, longer than broad, antero-lateral border robustly curved, surface devoid of hairs, margins rather convex and not upturned as in *Elamena truncata* (Stimpson, 1858) and *E. gracilis* (Borradaile, 1903), rostrum not hollowed above, bears a forwardly directed post ocular tooth underneath base (Figs 3e and 4b) thus differing from *E. sindensis* Alcock, 1900. The post ocular tooth is not visible in dorsal view unlike that of *E. cimex* Kemp, 1915. Eye stalk extended beyond

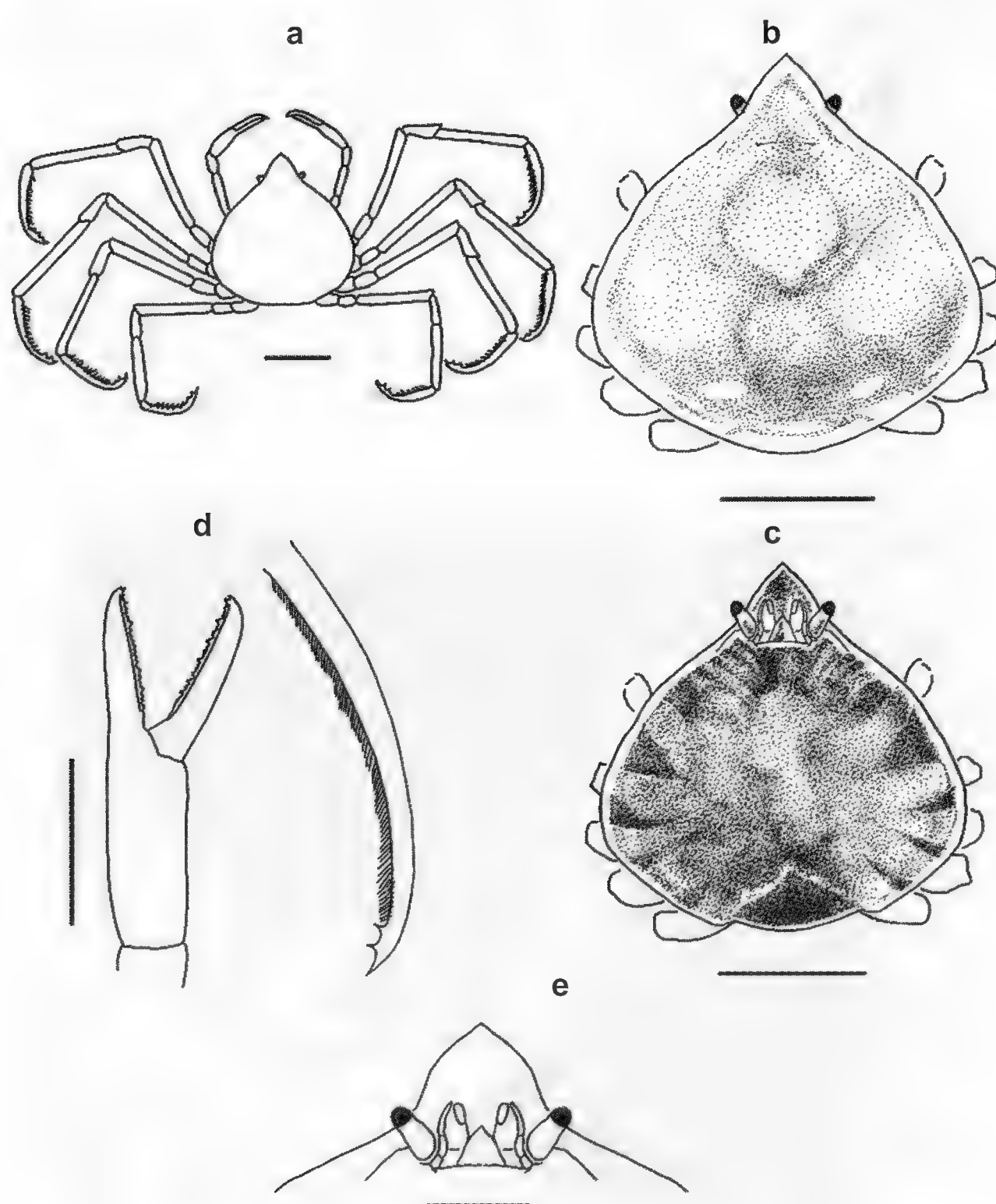


Fig. 3: *Elamena xavieri* Kemp, 1917 a. Habitus Dorsal view, b. Anterior region Dorsal view, c. Anterior region Ventral view, d. Chela of male and tip of dactylus of last walking leg. e. Anterior region ventral view depicting Post ocular tooth. Scale bars: a–c 2.5 mm; d, e 1.1 mm

Table 1: Morphometric measurements of *Elamena xavieri* Kemp, 1917

Morphometric parameters	Measurements (mm)
Carapace width	2.5
Carapace length	2.8
Frontal width	0.8
Abdominal width	2.0
Cheliped: Propodus length	1.0
Dactylus length	1.1
Merus length	0.8

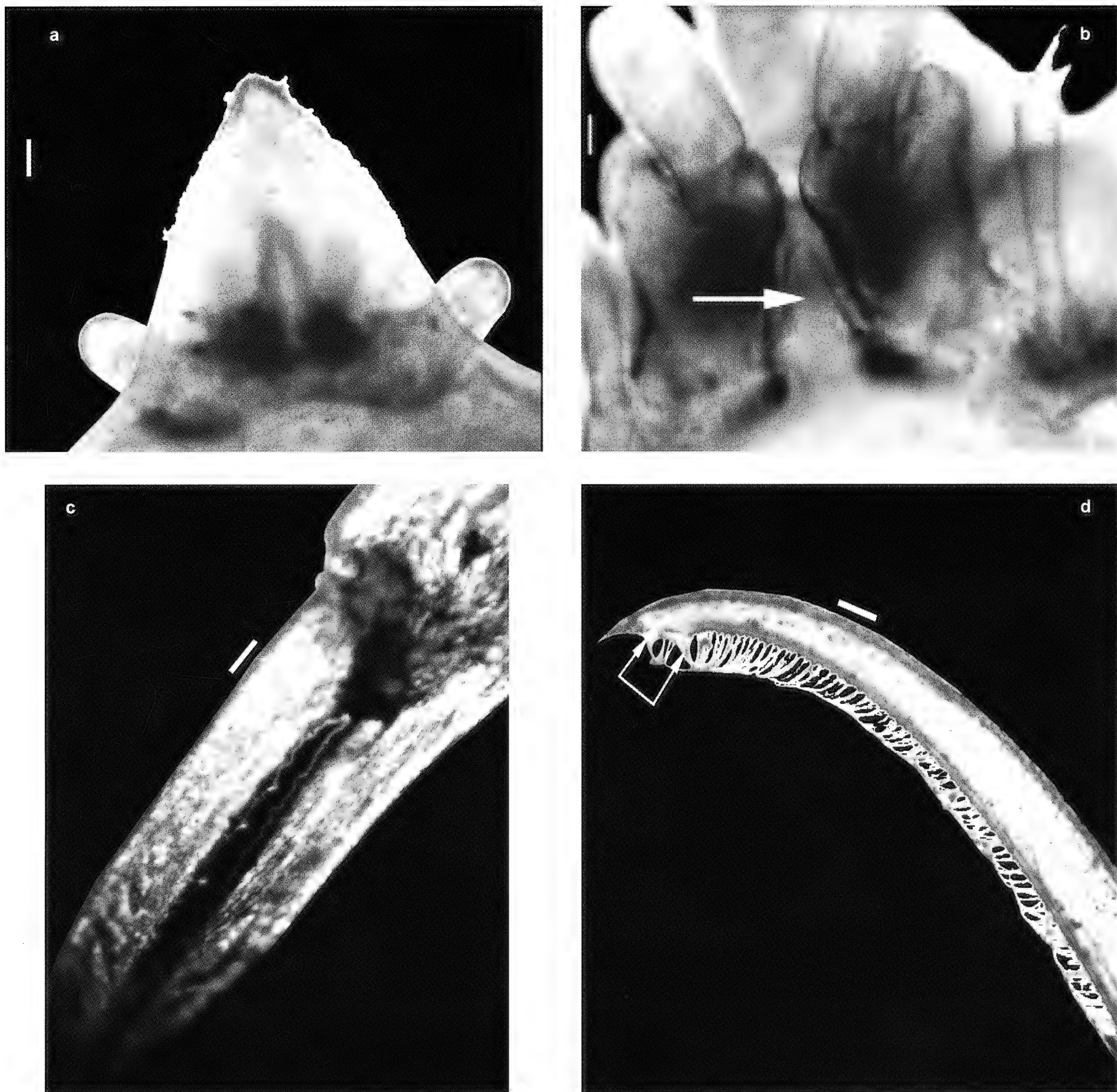


Fig. 4: Microphotographs depicting key diagnostic features of *Elamena xavieri* Kemp, 1917. a. Triangular rostrum, dorsal view b. Post ocular tooth, ventral view c. Chela of male d. Dactyli slender, curved, with fine hairs on inner margin and two recurved teeth at apex. Scale bars: 1 mm

carapace. Anterior border of buccal cavern convex on either side of middle line. Rostrum flat above, triangular and pointed (Fig. 4a). Antennules separated by distinct septum. Ischium of maxilliped longer than merus. Chelipeds not stouter than walking legs, as long as carapace; merus, carpus, and palm with short hairs; fingers and palm of same length. Fingers slightly incurved on inner face of chela and meet throughout their length when the claw is closed (Figs 3d and 4c). Each finger provided with small recurved teeth extending from the base to the apex. Merus and carpus of walking legs with

strong distal tooth; all segments with fine hairs. Dactyli slender, curved with fine hairs on the inner margin and two recurved teeth at the apex (Figs 3d and 4 d) unlike a single subdistal tooth observed in *Elamena samalensis* (Husana *et al.* 2013). Second pair of walking legs somewhat longer than the first or third. End pair shortest. Last segment of abdomen in male triangular, with a pair of prominent pits at the base.

The specimen examined was 1♂, Devi estuary, 20.ii.2015, (Biswaprajna Mohanty), Reg. No. RZEV CB-3 Odisha. The morphometric measurements are tabulated

(Table 1) for the specimen dredged from a depth of 10 m with a salinity of 28.7 psu of soft mud and sandy clay textured sediment habitats (sand 57.7%; silt 42.26%; clay 0.4%; organic matter 3.2%).

The distribution of this species is restricted to India. With the exception of an early report from Mandovi estuary, Goa, west coast of India (Kemp 1917) and a reference to the same (Dev Roy 2013), there has been no record or description from the east coast. Hence, through this note, a detailed description of *Elamena xavieri* has been attempted for the first time for documentation and affirmation of range extension of the species, sighted after a century.

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18. REDISCOVERY OF *TAMARIX APHYLLA* (L.) H. KARST. (FAMILY TAMARICACEAE) FROM MAHARASTHRA, INDIA

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Introduction

Genus *Tamarix* comprises approximately 90 species globally. *Tamarix aphylla* is distributed in Africa, Middle East, Afghanistan, Pakistan, and India. It is found as a cultivated species in North America and has earned weed status in Australia. In India, the genus is represented by nine wild species, namely *Tamarix aphylla* (L.) H. Karst., *T. dioica* Roxb. ex Roth., *T. indica* Willd., *T. pakistanica* Qaiser, *T. arceuthoides* Bunge, *T. leptostachya* Bunge, *T. ericoides* Rottler & Willd., *T. kutchensis* Shetty & Pandey, *T. passerinoides* Delile ex Desv. var. *macrocarpa* Ehrenb., and one ornamental species *T. chinensis* Lour.

During a field trip in Raigad district, Maharashtra, a large shrub was photographically documented in detail showing

all its characteristic features. The possible identity of the specimen was assessed as a member of genus *Tamarix*. After comparison with literature, the specimen was confirmed to be *Tamarix aphylla* (L.) H. Karst. (Almeida 1996; Mahabale 1987). *Tamarix aphylla* (L.) is distributed in Africa, Middle East, Pakistan, Afghanistan, and India.

A brief description and key is given with notes for easy identification.

Key to *Tamarix* species in India

1. Flowers unisexual; plants dioecious.....*T. dioica*
- Flowers bisexual.....2
2. Androecium haplostemonous; stamens 5.....3
- Androecium diplostemonous or partially diplostemonous;

- stamens 10 or 6–10.....7
3. Leaves vaginate; racemes spirally twisted*T. aphylla*
 — Leaves pseudo-vaginate, amplexicaul or narrowed at base; racemes not spirally twisted4
4. Leaves pseudo-vaginate or amplexicaul; sepals rounded or truncate at apex; plants of plains.....5
 — Leaves narrowed at base, at least some sepals acute at apex; plants of high altitude6
5. Rachis glabrous to sparsely papillose; racemes 3–4 (–5) mm broad; lobes of disc notched; filaments mesodiscine*T. indica*
 — Rachis densely papillose; racemes 5–7 mm broad; lobes of disc not notched; filaments epilophic to confluent-epilophic *T. pakistanica*
6. Lobes of disc notched; filaments mesodiscine
 *T. arceuthoides*
 — Lobes of disc not notched; filaments confluent-epilophic *T. leptostacya*
7. Leaves vaginate in lower part; racemes 1–1.5 (–2) cm broad; bracts more than 2 mm long; petals irregularly denticulate in upper half; stamens 10; disc fleshy.....
*T. ericoides*
 — Leaves amplexicaul or semi-amplexicaul; racemes 5–8 mm broad; bracts less than 2 mm long; petals entire, often emarginate; stamens 6–10; disc not fleshy8
8. Petals 2–2.5 x 1–1.5 mm; disc lobed; filaments epilophic; capsules less than 7 mm long*T. kutchensis*
 — Petals 3–4.5 x 2–2.5 mm; disc not lobed; filaments epidiscine; capsules more than 8 mm long.....
*T. passerinoides*

Tamarix aphylla (L.) Karst., Deut. Fl. 641.1882. *Thuja aphylla* L., Cent. Pl. 1: 32. 1755, p.p. *Tamarix orientalis* Forsskal, Fl. Aegypt-Arab. 206. 1775. *T. articulata* Vahl, Symb. Bot. 2: 48, t. 32. 1791, nom. illegit; Dyer in Fl. Brit. India 1: 249. 1874.

Tree or tall shrub, up to c. 13 m tall with reddish brown to grey bark, entirely glabrous. Leaves vaginate, abruptly

mucronate 1.5–2 (–3) mm long, with impressed punctate glands; reduced to tiny scales (1–2 mm long) and alternately arranged along the fine branchlets (similar in appearance to pine needles). Racemes mostly aestival, simple or compound, 2–6 cm long, spirally curved. Flowers bisexual, subsessile, pinkish white, pedicel <1 mm long. Bracts vaginate, ovate, acuminate, 1.25–1.5 mm long, 0.5 mm broad. Sepals 5, free, 1.5 mm long, c. 1 mm broad, almost entire, obtuse, broadly ovate to elliptic, outer 2 somewhat smaller than the inner 3. Petals 5, stamens 5, exerted, filaments filiform, 2 mm long, anthers cordate, somewhat apiculate. Disc deeply 5-lobed, the five filaments inserted in between lobes of disc (mesodiscine), insertion peridiscal. Stigmas 3, discoid, styles half the length of the ovary, ovary conical, 1.75–2 mm long. Capsule pyramidal, rounded at tip, 2.5–3.5 mm long, c. 1.5 mm broad. Seeds many, c. 0.5 mm long, coma 2–3 mm long.

Flowering & Fruiting: June to October, mainly in August and September.

Distribution: Africa (Morocco, Algeria, Tunisia, Libya, Egypt, Senegal, Sudan, Abyssinia, Eritrea, Somaliland, Kenya), Middle East (Israel, Jordan, Saudi Arabia, Yemen, Iraq, Kuwait, Iran), Afghanistan, Pakistan, and India (Punjab, Haryana, Delhi, Uttar Pradesh, Rajasthan, Gujarat, Maharashtra, Tamil Nadu). It is found as an introduced species, being planted in N. America, and has earned weed status in Australia.

Ecological Note: *Tamarix aphylla* is xerophytic and drought resistant. It grows best in loamy soil, but it is also found on sand and stiff clay, and on alkaline, saline, and seasonally waterlogged soils, and saline sodic soils.

Specimen examined: 2 specimens: INDIA: Maharashtra, Raigad district, 18° 41' 42.9894" N, 73° 1' 7.3452" E; 15.viii.2015, 14.viii.2016. *Coll:* Dr Samir Mehta.

Chromosome number: 2n=24

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19. A NEW LOCATION FOR A RARE LEGUME *FLEMINGIA ROLLAE* (FAMILY FABACEAE) AND NOTES ON ITS TYPIFICATION

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Introduction

Flemingia rollae (Billore & Hemadri) An. Kumar was first collected by Patwardhan in 1907 from Kalsubai hills, Ahmednagar district, Maharashtra. However, the specimens were identified as *F. involucrata* Benth. In 1970, this species was collected from Panshet forest, near Bari, Kalsubai hills, Ahmednagar district by Wadhwa. Billore and Hemadri (1982) described *Moghania rollae* Billore & Hemadri (now *F. rollae*) based on collections made by Patwardhan (*Patwardhan 1200 A-C*), Wadhwa (*Wadhwa 128313 A-J*) and Billore (*Billore 115683 A-F*).

Since the description of the species in 1982, it was not collected again until 2014 (Gavade and Lekhak 2015). During a botanical exploration in 2015, the authors collected some interesting plant specimens from Torna fort, Pune district, Maharashtra. Based on critical examination of the specimens and consultation of literature, the plant was identified as *Flemingia rollae*. So, the collection site constitutes a new locality for *F. rollae*.

The species is restricted to high altitude plateaus and resembles *F. nilgheriensis* (Baker) Wight ex Cooke, a weak stemmed species, but differs in its erect, robust habit, broader, longer, lanceolate-acuminate stipules, and larger inflorescence (Billore and Hemadri 1982).

The present work provides a detailed description of *F. rollae*, notes on typification and ecology.

Taxonomy

Flemingia rollae (Billore & Hemadri) An. Kumar in *J. Econ. Taxon. Bot.* 4(1): 232. 1983; Sanjappa, Leg. India: 178. 1992; Kothari in Singh *et al.*, Fl. Maharashtra 1: 687. 2000. *Moghania rollae* Billore & Hemadri in *J. Econ. Taxon. Bot.* 3(2): 617. 1982.

Lectotype (designated here): INDIA: Maharashtra: Ahmednagar district, Kalsubai hills, 13.x.1907, *Patwardhan 1200* (BSI).

Erect herb, 20–45 cm long with branched stem; stems 3–4 mm in diameter, angular, pubescent with long white hairs, gland-dotted. Leaves trifoliate, 4.4–9.0 cm long, stipulate; petiole 1.3–2.2 cm long, pubescent with white hairs, gland-dotted; stipules 2, ovate, acuminate, fused, separate at maturity, 1.2–1.8 × 0.4–0.5 cm, persistent, basifixed, many nerved. Leaflets 2.5–4.8 × 1.2–3 cm, ovate to elliptic; middle leaflet cuneate at base; lateral leaflets asymmetrical or oblique at base, pubescent on both surfaces, gland-dotted beneath, ciliate at margins; petiolules 1–2 mm long, pubescent. Inflorescence terminal heads or capitate, 15–25-flowered; flower 1.3–1.4 cm long; pedicel 2–3 mm long; bracts ovate, acuminate, 1.1–1.2 × 0.3–0.4 cm, many-nerved, gland-dotted, densely hairy; hairs white, antrorse. Calyx 1.2–1.3 × 0.4–0.5 cm, pubescent, gland-dotted on outer surface; calyx tube 4–5 mm long, campanulate, hairy, gland-dotted; calyx teeth 5, equal, 7–8 × 2 mm, linear to lanceolate, connate for 1/3 of their length, many-nerved. Corolla purple; standard *c.* 1.2 × 1.1 cm, obovate, retuse at apex, pubescent, gland-dotted on outer surface, clawed with 2 auricles at base; wings 1.2 × 0.5 cm, oblong, pubescent, gland-dotted on outer surface, claw 5 mm long, auricles *c.* 1 mm long; keel petals 1 × 0.3 cm, fused half of their length on lower side, slightly falcate, claw 4 mm long, auricle less than 1 mm, pubescent, gland-dotted on outer surface. Stamens 10, diadelphous (9+1); staminal tube 7–8 × 1.5–2 mm; anthers uniform, less than 1 mm, basifixed; filaments of united stamens 3–4 mm long, those of free stamens 7–8 mm long. Ovary 2–2.5 × 1–1.5 mm, sub-sessile, hairy on margin, hairs white, antrorse; ovules 1–2; styles 7–8 mm long, glabrous, swollen at middle; stigma capitate, hairy. Pod 1.2–1.4 × 0.4–0.5 cm, calyx exceeding the pod, beaked, turgid, glabrous; beak <1 mm long; 1-seeded. Seed 1, 4 × 2 × 2 mm, brown, oval, hilum less than 1 mm long (Fig. 1).

Flowering and Fruiting: October to November.

Specimens examined: INDIA: Maharashtra: Ahmednagar district, Panshet forests, Kalsubai hills, near Bari, 3.x.2014,

Gavade & Lekhak 6 (SUK); Harishchandragad, near Pachnai, 4.x.2014, *Gavade & Lekhak* s.n. (SUK); Pune district, Torna fort, 26.ix.2015, *Nandikar & Giranje* 1403 (SUK).

Ecology and Distribution: In the present survey *Flemingia rollae* was found growing on the high altitude plateau of Kalsubai (19° 35' 58.14" N; 73° 42' 49.86" E), Ahmednagar district and Torna (18° 17' 3.48" N; 73° 37' 26.04" E) Pune district, Maharashtra. It occurs on hill slopes, rocky crevices, and plains at elevations from 700–1,500 m above msl. It grows in association with other species, namely *Adelocaryum* sp., *Adenoon indicum* Dalzell, *Barleria sepalosa* C.B. Clarke, *Ceropegia sahyadrica* Ansari & B.G.Kulk., *Chlorophytum glaucum* Dalzell, *Delphinium malabaricum* (Huth) Munz, *Echinops echinatus* Roxb., *Neuracanthus* sp., and *Pleocaulus ritchei* (C.B. Clarke) Bremek.

Nomenclatural note

Billore and Hemadri (1982) described *Moghania rollae* (now *Flemingia rollae*) based on specimens of Patwardhan (*Patwardhan* 1200 A-C), Wadhwa (*Wadhwa* 128313 A-J) and Billore (*Billore* 115683 A-F). They mentioned that the holotype is at CAL; isotypes are at BSI, BLAT, K, and MH (K and MH: acronyms of the herbaria of Royal Botanic Gardens, Kew, England, U.K. and Southern Regional Center, Botanical Survey of India, Coimbatore, Tamil Nadu, respectively) and

paratypes at BSI. Gavade and Lekhak (2015) designated neotype of *F. rollae* for this binomial, as they could not trace any original material in the relevant herbaria (BSI, BLAT, K and MH). However, during a visit in January 2016 to Western Regional Centre, Botanical Survey of India (BSI), Pune, as part of revisionary work on the genus, the authors could trace one relevant sheet (*Patwardhan* 1200). A perusal of the protologue reveals that the sheet was cited as a paratype. Since there are no existing holotype and isotypes, the paratype (*Patwardhan* 1200) is designated here as the lectotype, superseding the neotype designated earlier by Gavade and Lekhak (2015), following Art. 9.19 (a) of ICN (McNeill *et al.* 2012).

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20. *ELEOCHARIS KHANDWAENSIS* (FAMILY CYPERACEAE): A NEW RECORD FOR MAHARASHTRA, INDIA

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Introduction

The genus *Eleocharis* R. Br. is widely distributed from tropical to temperate regions of both hemispheres (Prasad and Singh 2002). Recently, Govaerts *et al.* (2015) have reported about 297 species, 12 subspecies, and 17 varieties for the world. In India, it is represented by about 21 species (Prasad and Singh 2002). Recently, *Eleocharis wadoodii* S.R. Yadav, Lekhak & Chandore and *E. konkanensis* Chandore, Borude, Kambale & S.R. Yadav have been described from the state of Maharashtra (Chandore *et al.* 2016; Yadav *et al.* 2009). Another species of *Eleocharis* i.e. *E. khandwaensis* Mujaffar, Chandore & S.R. Yadav has been described from the state of Madhya Pradesh (Mujaffar *et al.* 2014). Similarly, one more species *E. setifolia* (A. Rich) Raynal has been recorded for India by Wadoodkhan (2015). Therefore, the present count of *Eleocharis* in India is about 25 species including 3 new species and one addition. At present, 14 taxa (10 species, 3 subspecies, and one variety) of *Eleocharis* (including *E. khandwaensis*) have been reported from the state of Maharashtra.

As part of a taxonomic revision of genus *Eleocharis* in

India, the Vidarbha region of Maharashtra was surveyed in October 2015. During the survey, we collected some specimens of *Eleocharis* R. Br. On examination of the literature (Koyama 1985; Mujaffar *et al.* 2014) and critical analysis of specimens, the identity of the species was revealed as *Eleocharis khandwaensis* Mujaffar, Chandore & S.R. Yadav. Further scrutiny of literature (Lakshminarasimhan 1996; Wadoodkhan 2015) revealed that this species has not been recorded so far from Maharashtra state. Hence, it is reported here as a new record for Maharashtra state.

Eleocharis khandwaensis Mujaffar, Chandore & S.R. Yadav in Nord. J. Bot. 32: 710–712, 2014.

Perennial herb. Rhizome *c.* 3 cm long, *c.* 1.5 cm thick. Stolons slender, *c.* 15 cm long, *c.* 3 mm thick, covered with reddish to brown scales. Root *c.* 15 cm long × 1.5 mm thick. Culms erect, densely tufted, leafless, *c.* 100 cm high, 2–5 mm wide, terete, acute at apex, shiny, striate when dry, transversely septate, hollow between septa, deeply green, yellowish brown when dry. Sheaths membranous; outer sheath up to 7 cm long, purple to brownish; inner

Table 1: Comparison between *Eleocharis dulcis*, *E. lankana* and *E. khandwaensis*

Characters	<i>Eleocharis dulcis</i>	<i>E. lankana</i>	<i>E. khandwaensis</i>
Stolon	Present	Absent	Present
Culms	50–100 cm tall, soft, flat after pressing and drying	20–25 cm tall, rigid, slender after pressing and drying	<i>c.</i> 100 cm tall, rigid, slender after pressing and drying
Spikelet	Cylindrical, not wider than the culms	Cylindrical, not wider than the culms	Terete to angular, as broad as or narrower than culms
Glumes	Obtuse or rounded	Acute	Acute
Perianth bristles	Two to three times longer than achene	As long as to slightly longer than achene	As long as to slightly longer than achene
Perianth bristle spinules	Stout	Stout	Weak
Achene shape	Obovoid to suborbicular	Obovoid	Oval–obovate
Achene colour	Yellowish brown to dark brown	Brown to olive	Dark brown to black
Achene surface	Epidermal cells very small, hexagonal in many vertical rows	Epidermal cells isodiametrically hexagonal to vertically rectangular	Epidermal cells isodiametrically hexagonal to pentagonal

sheath 15–30 cm long, yellowish to light brown, oblique at mouth. Spikelets straight, terete to angular, as broad as or narrower than culm, contracted to acute at apex, 2.0–4.0 cm long, 2.5–4.0 mm in diameter, densely many-flowered, green to pale yellowish; rachilla persistent, acuminate; bracts glume-like, sterile, 3.0–4.0 mm long. Glumes imbricate, all fertile, ovate to oblong, *c.* 6.5 × 3 mm, cartilaginous, closely imbricate except the loose sub-rounded tips, convolute when dry, *c.* 1/2 overlapping, acute to subacute, scarious along margins; mid-nerve prominent. Hypogynous bristles *c.* 6, unequal, several as long as nut or 1 to 2 shorter than nut, 1 or 2 slightly overtopping the nut; spinules in upper 2/3 of nut, linear to gradually narrowed upwards, slightly connate at base. Stamens 3. Style bifid or trifid; style-base articulate but persistent on the nut. Achene biconvex, oval-obovate, 1.8–2.0 × 1.7–1.8 mm, abruptly narrowed at base, constricted below the annular apex into a short neck; epidermal cells isodiametrically hexagonal to pentagonal, dark brownish to black.

Flowering: Aug–Sept. **Fruiting:** Oct–Nov.

Habitat: *Eleocharis khandwaensis* grows in natural ponds in typical association with *Aponogeton natans* (L.) Engl. & K. Krause, *Hydrilla verticillata* (L.f.) Royle, *Nechamandra alternifolia* (Roxb. ex Wight) Thwaites, *Nymphoides cristata* (Roxb.) Kuntze, *Ottelia alismoides* (L.) Pers., *Potamogeton nodosus* Poir., and *Sagittaria guyanensis* Kunth.

Distribution: INDIA: Madhya Pradesh, Khandwa district, Bamangaon village and Tirandaz village (Mujaffar *et al.* 2014). Recently, we have collected it for the first time from outside the type locality i.e. Allapali, Gadchiroli, Maharashtra.

Specimens examined: INDIA: Maharashtra [Gadchiroli district, Allapali lake, 12.x.2015, A.N. Chandore 1972 (SUK)]; Madhya Pradesh [Khandwa district, Bamangaon village, 22.ix.2012, Mujaffar 4520 (SUK!); Khandwa district, Tirandaz village 11.ix.2013, Chandore 1831 (SUK)].

Note: Morphologically, *Eleocharis khandwaensis* is similar to *E. lankana* T. Koyama but it differs from this species by stolons present (*vs* absent), perianth bristle spinules weak (*vs* stout), achene annulate apex with a short neck (*vs* without neck or neck short), base of achene abruptly narrowed (*vs* attenuate), colour of achene dark brown to black (*vs* brown to olive), achene surface epidermal cells isodiametrically hexagonal to pentagonal (*vs* isodiametrically hexagonal to vertically rectangular). The detailed comparison between *Eleocharis dulcis*, *E. lankana*, and *E. khandwaensis* is given in Table 1.

Key to the species of *Eleocharis* R.Br. (Maharashtra)

- 1a. Culms 1–12 mm in diameter, generally more than 30 cm tall

- 2a. Culms with transverse septa
 3a. Glumes obtuse or rounded
 4a. Perianth bristles two to three times longer than achene *E. dulcis*
 4b. Perianth bristle as long as to slightly longer than achene *E. equisetina*
 3b. Glumes acute
 5a. Stolon present; colour of achene dark brown to black *E. khandwaensis*
 5b. Stolon absent; colour of achene brown to olive *E. lankana*
 2b. Culms without transverse septa
 6a. Stem triquetrous
 7a. Glumes obtuse, spirally arranged *E. spiralis*
 7b. Glume acute, imbricate *E. acutangula*
 6b. Stem tetraquetrous *E. wadoodii*
 1b. Culms less than 1 mm in diameter, generally less than 30 cm tall
 8a. Spikelet usually proliferous at base; nutlet olivaceous or yellowish when mature with small pits on surface *E. retroflexa* ssp. *chaetaria*
 8b. Spikelet not proliferous at base; nutlet generally brownish or black when mature without pits on surface
 9a. Achene biconvex; style 2 cleft
 10a. Style base conical; lower two glumes sterile; achene ovate *E. geniculata*
 10b. Style base discoid; glumes all fertile; achene obovoid *E. atropurpurea*
 9b. Achene trigonous; style 3 cleft
 11a. Culms quadrangular, basal tuber present, perianth bristles absent *E. setifolia*
 11b. Culms pentangular, basal tuber absent, perianth bristles present *E. konkanensis*

Key to the subspecies of *Eleocharis acutangula* (Roxb.) Schult.

- 1a. Perianth bristles as long as or slightly longer than achene subsp. *acutangula*
 1b. Perianth bristles shorter than achene ..subsp. *brevisetia*

Key to the varieties of *Eleocharis atropurpurea* (Retz.) J. Presl & C. Presl

- 1a. Perianth bristles present var. *atropurpurea*
 1b. Perianth bristles absent var. *vengurlaensis*

Key to the subspecies of *Eleocharis lankana* T. Koyama

- 1a. Spikelets terete; rhizome without stolon subsp. *lankana*
 1b. Spikelets angular; rhizome having stolon subsp. *mohamadii*

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